Final

Technical Support Document For Record Of Decision

Tatalina, AFS

Prepared for

USAF OEHL
Brooks, AFB, Texas

February 29, 1988

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FINAL

INSTALLATION RESTORATION PROGRAM
TECHNICAL SUPPORT DOCUMENT
FOR RECORD OF DECISION
TATALINA AIR FORCE STATION
LRRS SITE

Prepared for

USAF

Prepared By
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701 Sesame Street
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Tatalina AFS

RECORD OF DECISION

Installation: The Tatalina AFS is located in the south-central interior of Alaska. The area is surrounded by an upland spruce/hardwood forest-type habitat.

Scope of Decision: This record of decision and supplemental support document applies to eleven potential hazardous waste sites identified at Tatalina AFS. The recommendations for all eleven sites are the same; therefore, a single document for the entire installation is warranted.

Statement of Basis:

The findings and decisions on the Tatalina AFS presented in this report are based on the following:

- 1987 site visit by personnel of Woodward-Clyde Consultants and the U.S. Air Force.

- Comprehensive literature search and review.

- Information gathered from governmental regulatory agencies and a review of active environmental permits issued by state and federal agencies. The following permits or approvals have been issued for sites identified during Phase I:

  Solid Waste Disposal Permit (site 4)

- Review of the physical, chemical and toxicological characteristics of suspected or known contaminants.

- Preliminary Assessment Form submitted by EPA.

Tatalina AFS

Regulatory Agency Concerns:

No written comments on Tatalina AFS were received from ADEC or U.S. EPA which expressed concerns after the 1987 site visit. However, informal comments and suggestions from both agencies have been included in this document.

Description of Selected Remedy:

For all eleven sites, the selected remedy is "No further Action." The reasons for this decision are:

- For all eleven (11) sites at the Tatalina AFS, the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations.

- Based on an evaluation of alternatives, the benefits of remedial action or further study do not significantly outweigh the risks presently existing at each site.

- The costs of remedial action or further study are excessive relative to the derived benefit.

It is noted that site 4, the current landfill, is a facility which is currently permitted by the Alaska Department of Environmental Conservation and subject to stringent regulation. This site is not included in the scope of studies funded by the Defense Environmental Restoration Account (DERA). Mention of the site (as site 4) is included in this document for informative purposes only and recommendations or conclusions concerning the site are not part of the No Further Action decision.

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Information presented in this document supports a finding that there is no significant impact on human health or the environment from suspected or confirmed past contamination at the Tatalina AFS.

The recommended remedy is no further action with regard to investigation or cleanup of eleven (11) sites identified as possible areas of contamination at the Air Force station.

Declarations:

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended, and the National Contingency Plan Act (NCP) as amended, provide for Trustee and Regulatory Agencies to determine the appropriate actions at Federal facilities where oil or hazardous substances may have been used or disposed.

Based on the best, currently available information for all eleven (11) sites at Tatalina AFS, the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations. Such considerations include avoidance of environmental damage resulting from further investigations or cleanup and absence of exposure to human receptors. In all cases, further cleanup activities would create a disproportionate amount of damage, especially to the fragile ecosystem, relative to the amount of contamination which could be recovered and to other derived benefits. In summary, the "No Further Action" alternative will adequately protect public health, welfare, and the environment.

The Air Force determines that the action being taken is appropriate when balanced against the availability of DERA or other monies for use at potentially contaminated sites.

Tatalina AFS

Specific attributes of the site that suggest or support the "No Further Action" alternative are as follows:

- Permafrost and bedrock close to the surface preclude the possibility of significant vertical migration of potential contaminants.
- The absence of significant migration pathways indicates that the mobility of potential contaminants is extremely limited.
- Human health risks are negligible.
- Significant contamination was not observed at any site.
- No threatened or endangered species are known to use or exist on the installation.
- No economically or commercially important species use or exist on the installation.
- Unique or sensitive environmental areas and receptors will not be affected.

DAVID R. PAULSEN, Colonel, USAF
Commander, 11 TCG

7 MAR 88
Date

Tatalina AFS

REVIEW AND CONCURRENCE:

Jacques Brunaro
U. S. Environmental Protection Agency
Region 10, Alaska Operations Office

21 Feb 1988
Date

Ruth V. Lamoreaux
State of Alaska
Department of Environmental Conservation

July 22, 1988
Date

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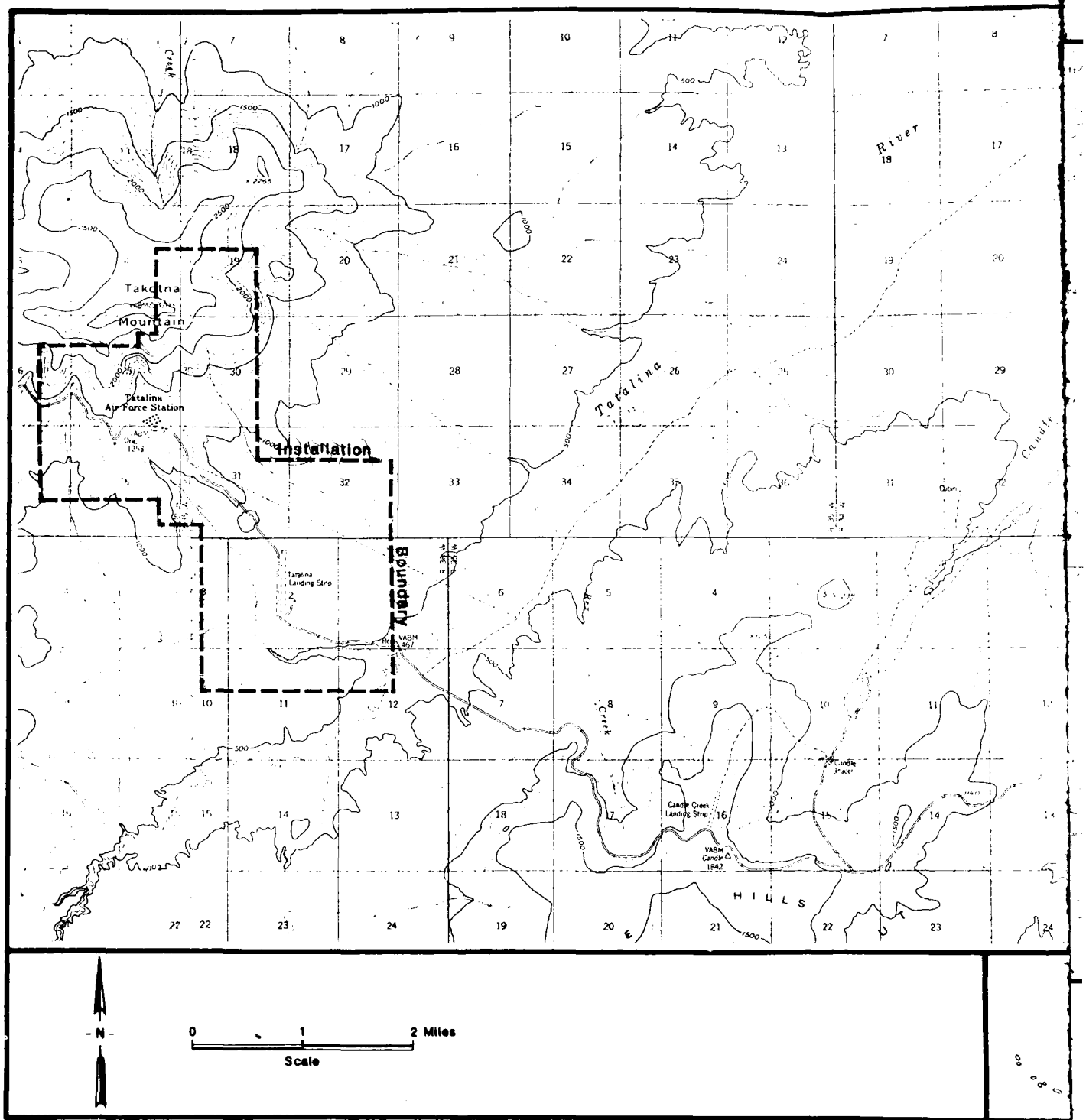
1.0 SUMMARY

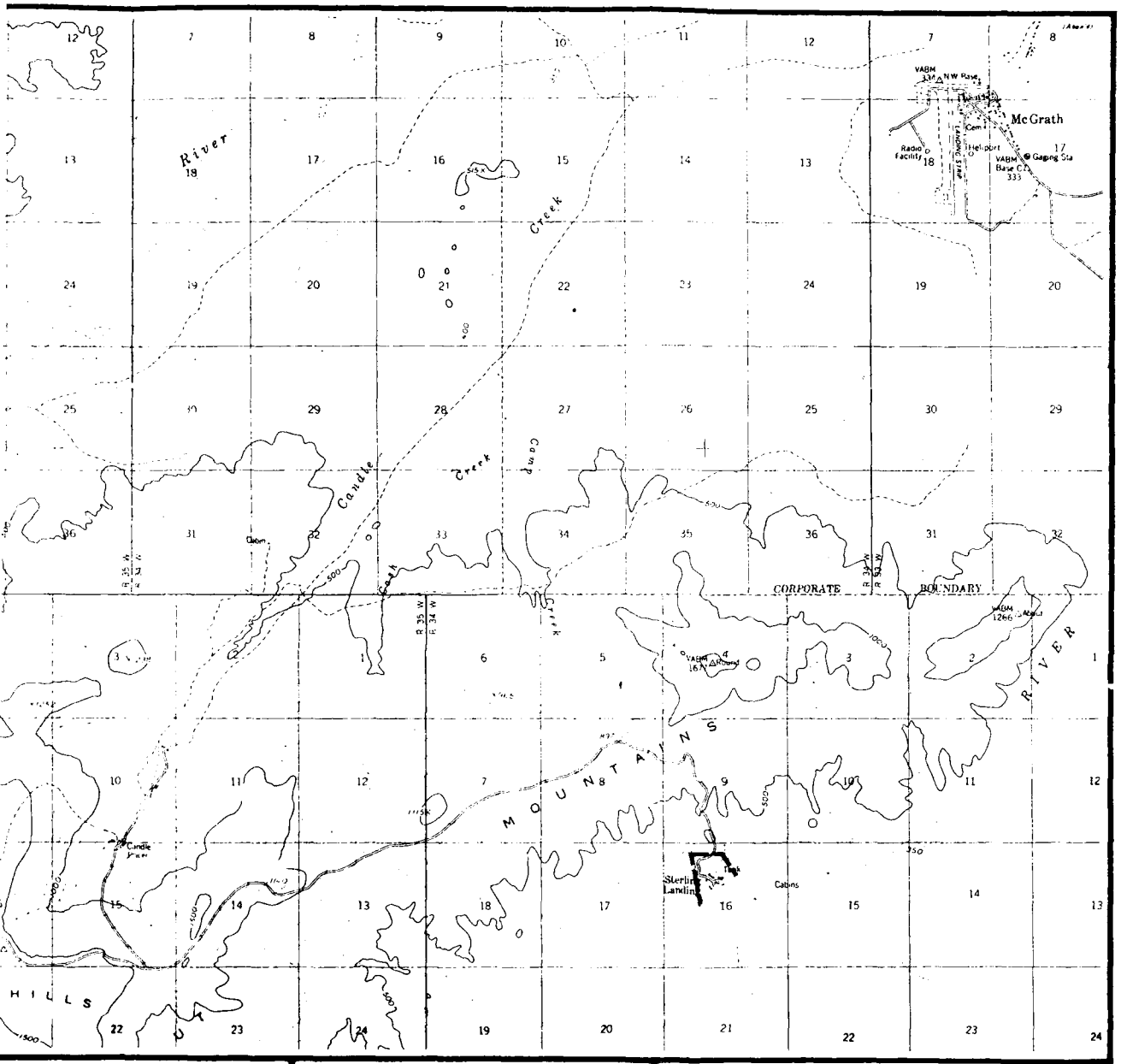
1.1 INTRODUCTION

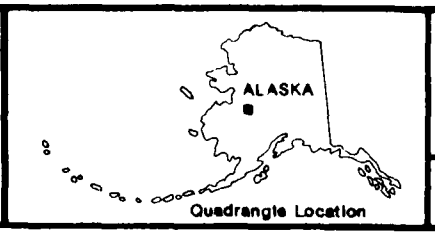
The Tatalina Air Force Station (AFS), located in the south-central interior of Alaska, was investigated under Phase I of the Installation Restoration Program (IRP). The findings of that study indicated eleven potentially contaminated areas at the installation (Eng. Sci. 1985). The report recommended follow-up action for all sites. A 1987 field visit verified that clean up has occurred at several sites. No evidence of significant contamination was observed at the sites where cleanup activities had not occurred. The following document presents the information collected in support of no further action at Tatalina AFS.

1.2 SITE DESCRIPTION AND SETTING

The Tatalina AFS is located on the eastern flank of the Kuskokwim Mountains about 390 km northwest of Anchorage (Figure 1). The station consists of approximately 2030 hectares near the base of Takotna Mountain. The nearest settlement is Takotna, a Native Alaskan community about 9 km north of the AFS. The larger community of McGrath is located 23 km to the east. The topography in the vicinity of the cape is moderate. The Tatalina River is located 1.5 km east of the installation airstrip. The larger Kuskokwim and Takotna rivers are 18 km to the east and 7 km to the west, respectively (Figure 1).


Takotna Mountain
Tatalina Air Force Station
Installation
Boundary
Tatalina Landing Strip
Tatalina River
Candle Creek Landing Strip
VABM Candle
1842
HILLS
- N -
0
1
2 Miles
Scale





TATALINA AFS
TOPOGRAPHIC MAP

Woodward-Clyde Consultants

Figure 1

2

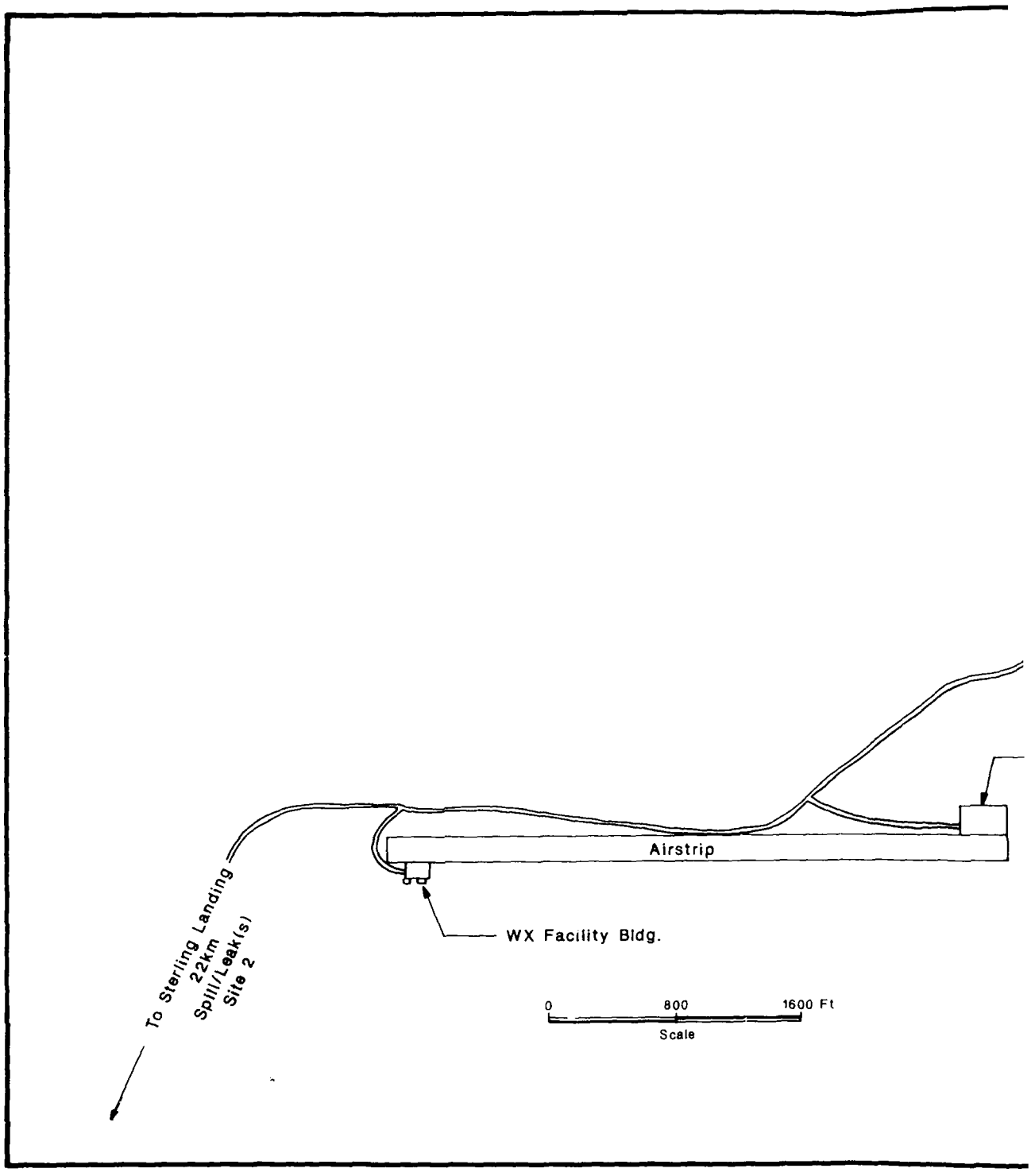
Tatalina AFS

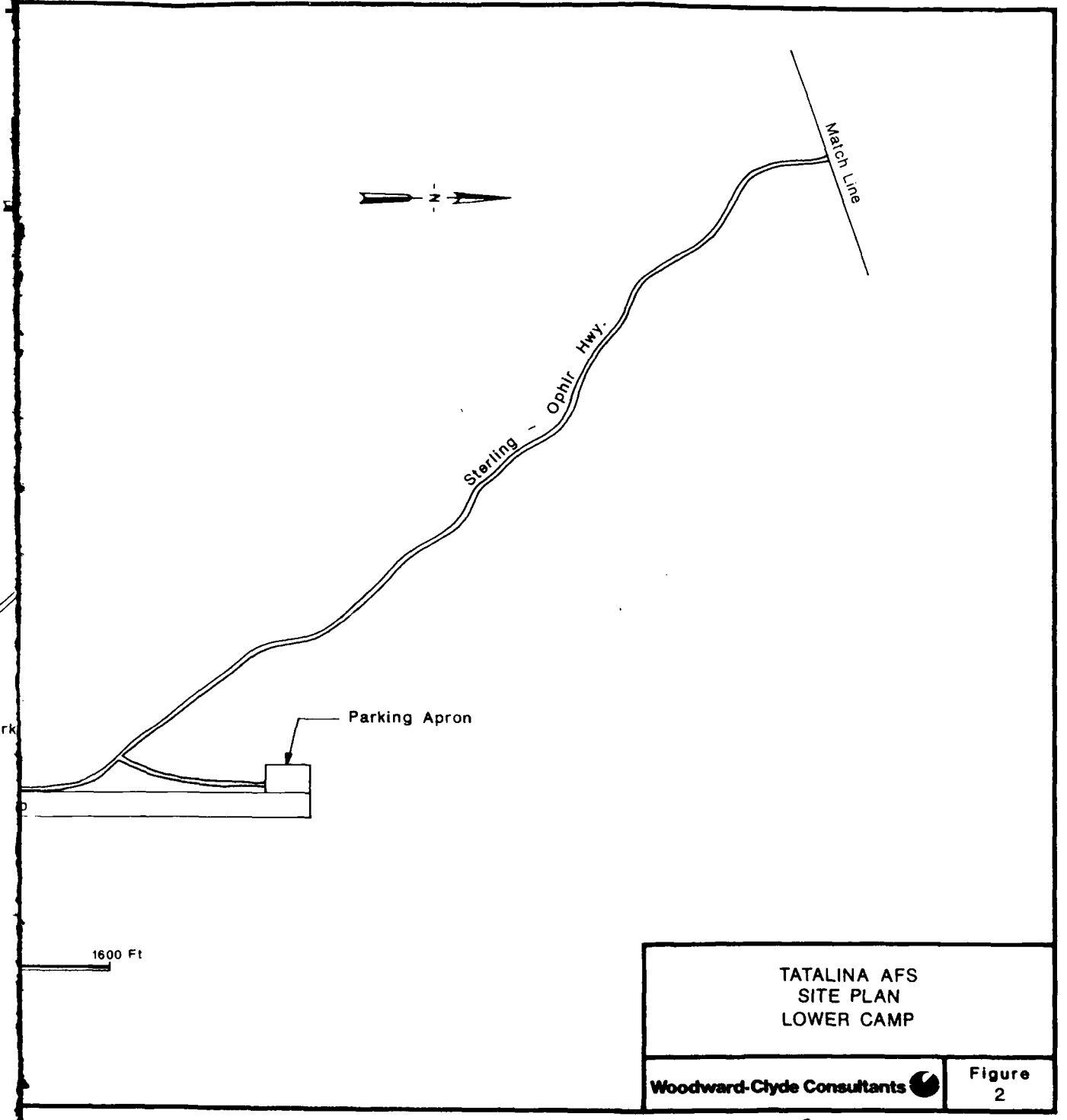
Tatalina AFS is divided into four active parts: an Upper Camp; a Lower Camp; an airstrip east of the Lower Camp; and a fuel depot along the Kuskokwim River at Sterling Landing (Figures 2 and 3). Several gravel roads connect the active parts of the AFS. The installation is also connected by road to the village of Takotna.

1.3 SITE HISTORY

Tatalina AFS was one of the ten original Aircraft Control and Warning (AC&W) sites constructed in Alaska as part of the Air Defense System. The site became operational in 1953. In 1957, a White Alice Communication Station (WACS) was added. The WACS was deactivated in 1979 and an Alascom satellite earth terminal system was installed. In 1985 a Minimally Attended Radar (MAR) unit was activated allowing significant staff reductions.

The Phase I report identified 11 potential sites of contamination at Tatalina (Table 1). Sites 1, 2, 3, and 9 are spill/leak areas. Sites 5, 7, 8, and 10 are previously used dumpsites or waste accumulation areas. The active landfill and the active waste accumulation area were designated as sites 4 and 11, respectively. Site 6 is an area of past road oiling. A 12th site, the White Alice site, was determined to have minimal potential to create environmental contamination, and is excluded from further discussion (Eng. Sci. 1985).

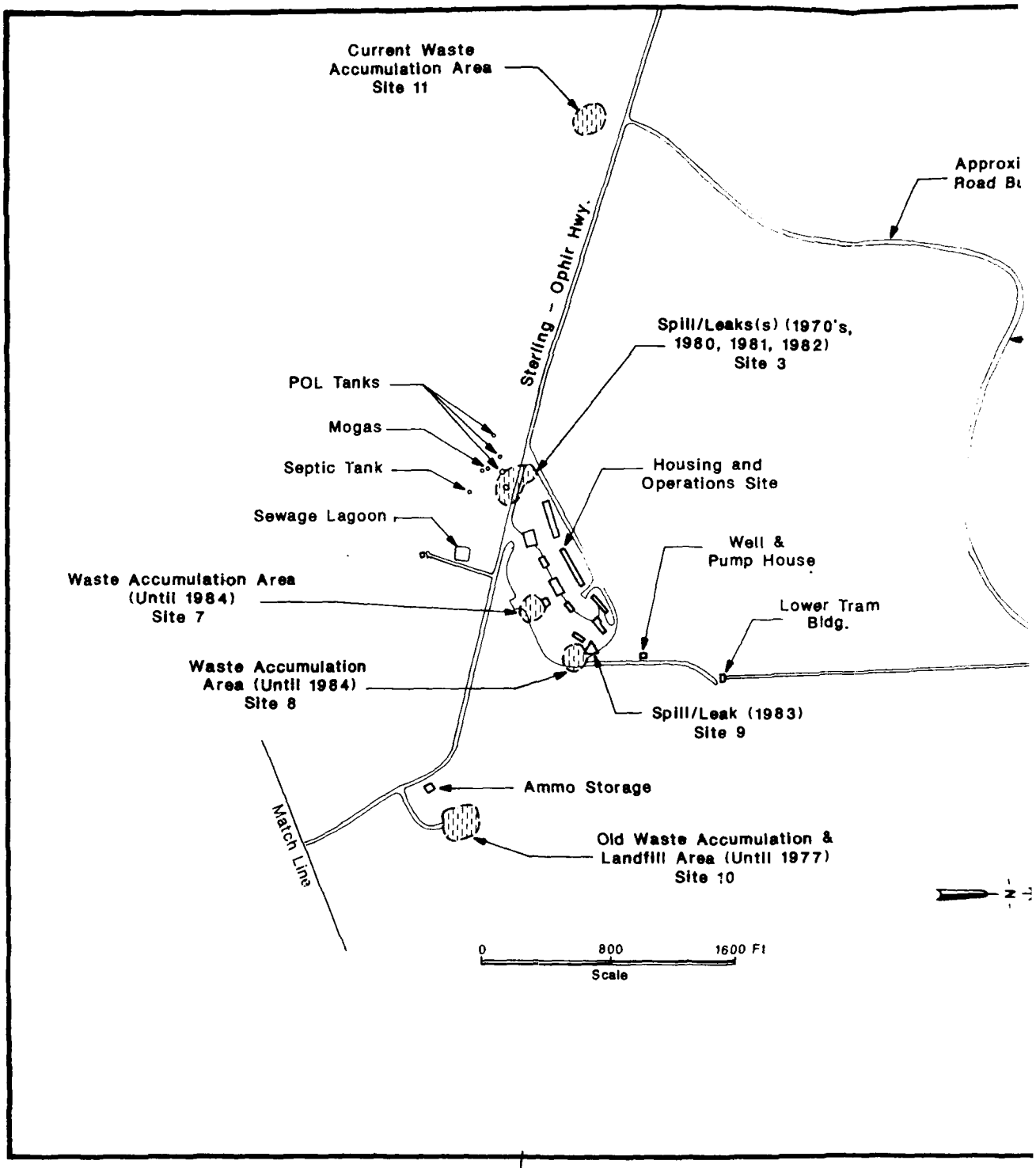

Airstrip
WX Facility Bldg.
To Sterling Landing
22km
Spill/Leak(s)
Site 2
0
800
1600 Ft
Scale

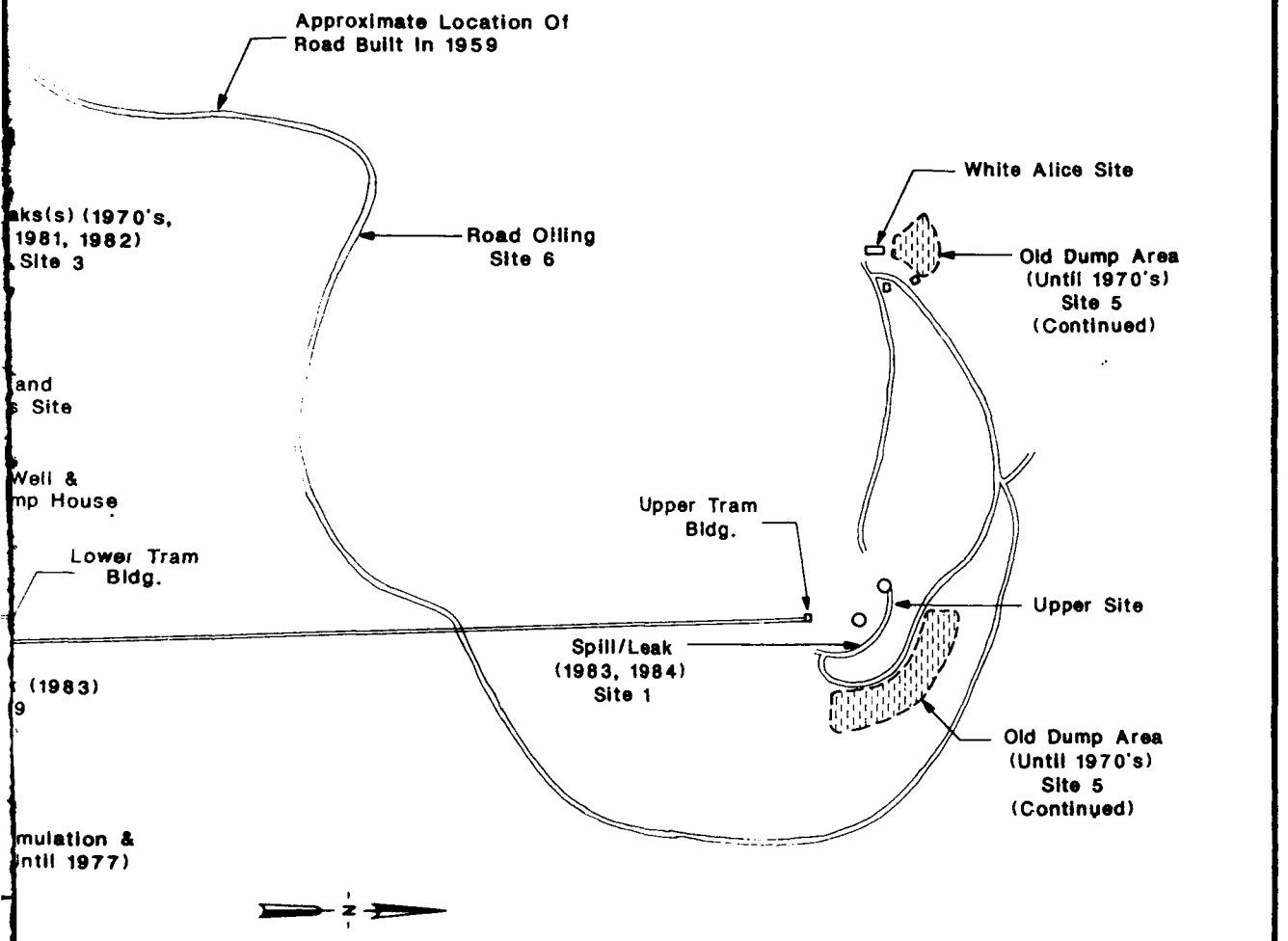


TATALINA AFS
SITE PLAN
LOWER CAMP

Woodward-Clyde Consultants

Figure
2


Current Waste Accumulation Area Site 11
Approxi
Road Bu
Sterling - Ophir Hwy.
Spill/Leaks(s) (1970's, 1980, 1981, 1982) Site 3
POL Tanks
Mogas
Septic Tank
Housing and Operations Site
Sewage Lagoon
Well & Pump House
Waste Accumulation Area (Until 1984) Site 7
Lower Tram Bldg.
Waste Accumulation Area (Until 1984) Site 8
Spill/Leak (1983) Site 9
Ammo Storage
Match Line
Old Waste Accumulation & Landfill Area (Until 1977) Site 10
0
800
1600 Ft
Scale



TATALINA AFS
SITE PLAN
UPPER CAMP

Woodward-Clyde Consultants

Figure
3

TABLE 1
PHASE 1 FINDINGS

Site Name/No.	Potential Contamination Problems and Remedial History	Recommended Action Phase I
Spill/leak Nos. 6 and 7 Upper Camp (site 1)	Diesel fuel leaks near the garage; 500 gal. or more each.	Rated a 69 according to HARM.* Follow-on Action: basic study to include test borings and 2-3 samples per boring.
Spill/leak No. 8 (site 2)	Routine diesel fuel leaks and spills at Sterling Landing.	Rated a 66 according to HARM.* Follow-on Action: one test boring at fill stand and one at a control location. Samples at 3-ft intervals.
Spill/leak Nos. 1, 2, 3 and 4 - Lower Camp (site 3)	Spills and leaks of POL products ranging from 500-1,000 gal. No recovery of any spilled POL.	Rated a 65 according to HARM.* Follow-on Action: intensive environmental study to include site reconnaissance, preliminary field investigation, and detailed site investigation.
Dump Area - Upper Camp (site 5)	Disposal of drums and other debris at two locations; partially cleaned in 1984.	Rated a 60 according to HARM.* Follow-on Action: basic study to include test borings, surface water and stream sediment sampling.
Road oiling - Lower Camp (site 6)	Waste oils and other wastes applied to roads for disposal and dust control.	Rated a 60 according to HARM.* Follow-on Action: basic study to include test borings along centerline of road.

TABLE 1 (Continued)

Site Name/No.	Potential Contamination Problems and Remedial History	Recommended Action Phase I
Waste Accumulation Area No. 3 - Lower Camp (site 7)	In use from 1950's to 1984. Minor spills and leaks from drums containing waste oils from power plant operation.	Rated a 59 according to HARM.* Follow-on Action: intensive environmental study in conjunction with site 3.
Waste Accumulation Area No. 4 - Lower Camp (site 8)	In use from 1950's to 1984. Minor spills and leaks from stored drums containing motor pool wastes.	Rated a 59 according to HARM.* Follow-on Action: intensive environmental study in conjunction with sites 3 and 7.
Spill/leak No. 5 (site 9)	Leaking MOGAS tanks and spills from truck fill stand. Leakage percolated into soil; no recovery.	Rated a 59 according to HARM.* Follow-on Action: intensive environmental study in conjunction with sites 3, 7 and 8.
Waste Accumulation Area No. 2 and Landfill No. 1 - Lower Camp (site 10)	In use from 1950's to 1977. Minor spills from wastes stored in drums. Landfill disposal of some shop wastes. Burning was practiced.	Rated a 58 according to HARM.* Follow-on Action: basic study to include monitoring well installation.
Waste Accumulation Area No. 1 - Lower Camp (site 11)	In use from 1977 to present. Minor spills and leaks from waste storage drums.	Rated a 57 according to HARM.* Follow-on Action: basic study including test borings.
White Alice Site (site 12)	In use from 1957-1979. Suspected spills, leaks and disposal of oil containing PCBs. Demolished and buried in 1987.	Rated a 48 according to HARM.* No Follow-on Action warranted.

Source: Phase I Engineering Science 1985

*Hazard Assessment Rating Methodology

1.4 CURRENT SITE STATUS

1.4.1 Site Visit

The Tatalina AFS was visited by representatives from the U.S. Air Force and Woodward-Clyde Consultants. The visit took place on August 26, 1987 and was part of a trip to other LRRS installations in Alaska. A written synopsis of the visit is on file with the Alaska Air Command, Elmendorf AFB, Alaska.

Sites visited at Tatalina AFS (Table 2) include an Upper Camp spill site (site 1), two spill/leak areas at the Lower Camp (sites 3 and 9), an Upper Camp dump area (site 5), an area of Lower Camp road oiling (site 6), two abandoned waste accumulation areas at the Lower Camp (sites 7 and 8), a contiguous abandoned waste accumulation area and old landfill (site 10) and the active landfill (site 4) and waste accumulation area (site 11) at the Lower Camp. One reported minor spill site at Sterling Landing on the Kuskokwim River (site 2) was not visited due to access problems.

Spill/leak Nos. 6 and 7 (site 1) were recorded near an Upper Camp garage. The garage was recently demolished and the area covered with fill. No evidence of contamination remains. Two dumps also exist at the Upper Camp (site 5, Figure 4). Both sites have been cleaned and graded; no contamination or debris was observed.

Several diesel fuel spills were recorded in the Lower Camp POL tank area (site 3, Figure 5). The survey team found a small area (30 x 18 m) of dead vegetation and soils that smelled of diesel and MOGAS situated downslope from Tank 2 (Figure 6). The topography at the site is moderately steep, and the soil is sandy. Thus, it was determined that any fuels spilled

TABLE 2
SITE VISIT FINDINGS 1987

Site Name/No.	Site Description	Observations	Recommended Action
Spill/leak Nos. 6 and 7 - Upper Camp (site 1)	Fuel spills have been recorded near the Upper Camp garage. The spills ranged from 500-1000 gal.	The garage was recently demolished and the area covered with fill. No evidence of contamination remains.	No action.
Spill/leak Nos. 1, 2, 3 and 4 - Lower Camp (site 3)	Spills and leaks reported from 4 large fuel tanks near station complex.	Small area of dead vegetation observed down slope from tank No. 2. Soil smelled slightly of diesel and MOGAS. No evidence of vegetative stress located further downslope.	No action.
Dump areas - Upper Camp (site 5)	One dump area is located near the top of the mountain; the other is several hundred yards downhill.	Both dump sites have been cleaned, graded, and backfilled. No evidence of contamination or debris remains.	No action.
Road oiling (site 6)	Occurred from 1950's to 1980's. Waste oils spread on roads to control dust.	No visible contamination.	No action.
Waste Accumulation Area No. 3 - Lower Camp (site 7)	Minor spills and leaks reported. Abandoned in 1984.	Area covered with 1 m of fill material in 1987. No evidence of contamination was seen.	No action.
Waste Accumulation Area 4 - Lower Camp (site 8)	Minor spills and leaks reported. Abandoned in 1984.	Area covered with 1 m of fill material in 1987. No evidence of contamination was seen.	No action.
Spill/leak No. 5 (site 9)	Small fuel spill reported at truck fill stand adjacent to new station complex.	The fueling station is located on a gravel pad. No evidence of a spill remains.	No action.

TABLE 2 (Continued)

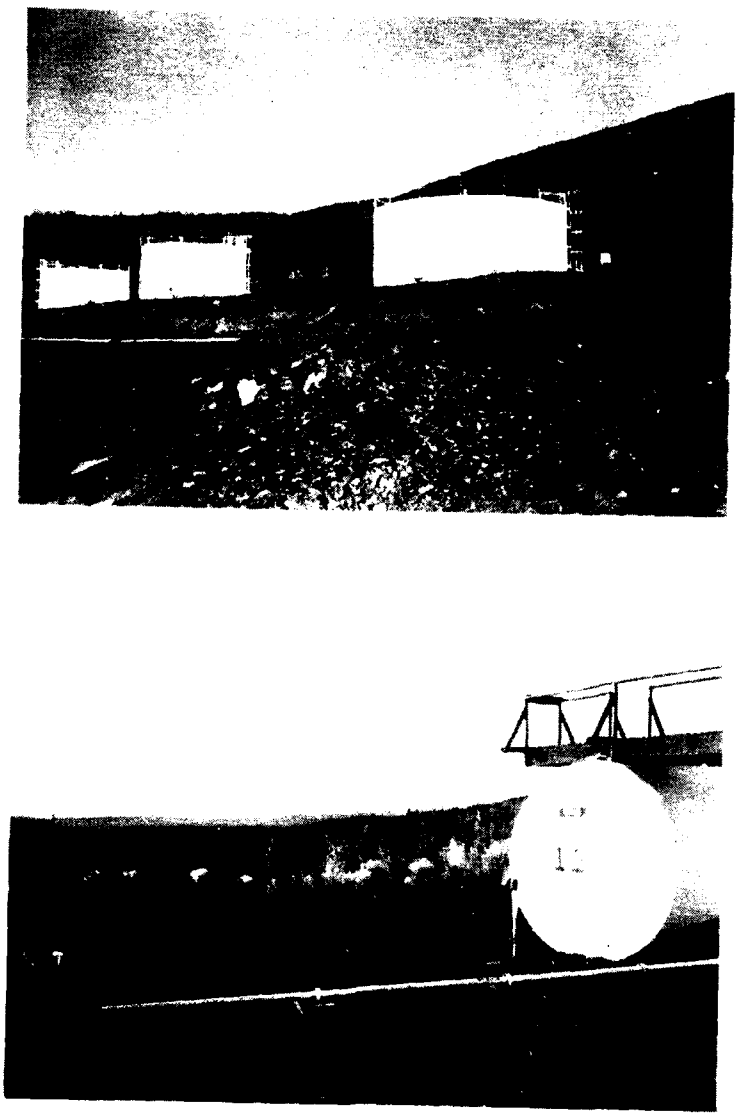
Site Name/No.	Potential Contamination Problems and Remedial History	Recommended Action Phase I	Recommended Action
Waste Accumulation Area No. 2 and Landfill No. 1 - Lower Camp (site 10)	Minor spills of stored wastes. Disposal of some shop wastes in landfill.	Both areas are closed and covered over. No contamination was observed.	No action.
Waste Accumulation Area 1 - Lower Camp (site 11)	Currently in use; minor spills and leaks reported.	A few dark stains were observed in older section of area. Dozens of barrels are stacked in new section awaiting testing prior to shipment off site. Several drums are leaking. No vegetative stress was observed.	No action.

Note: Site 2 not visited due to access problems; site 12 has been demolished and buried.

Source: Woodward-Clyde Consultants site visit notes.

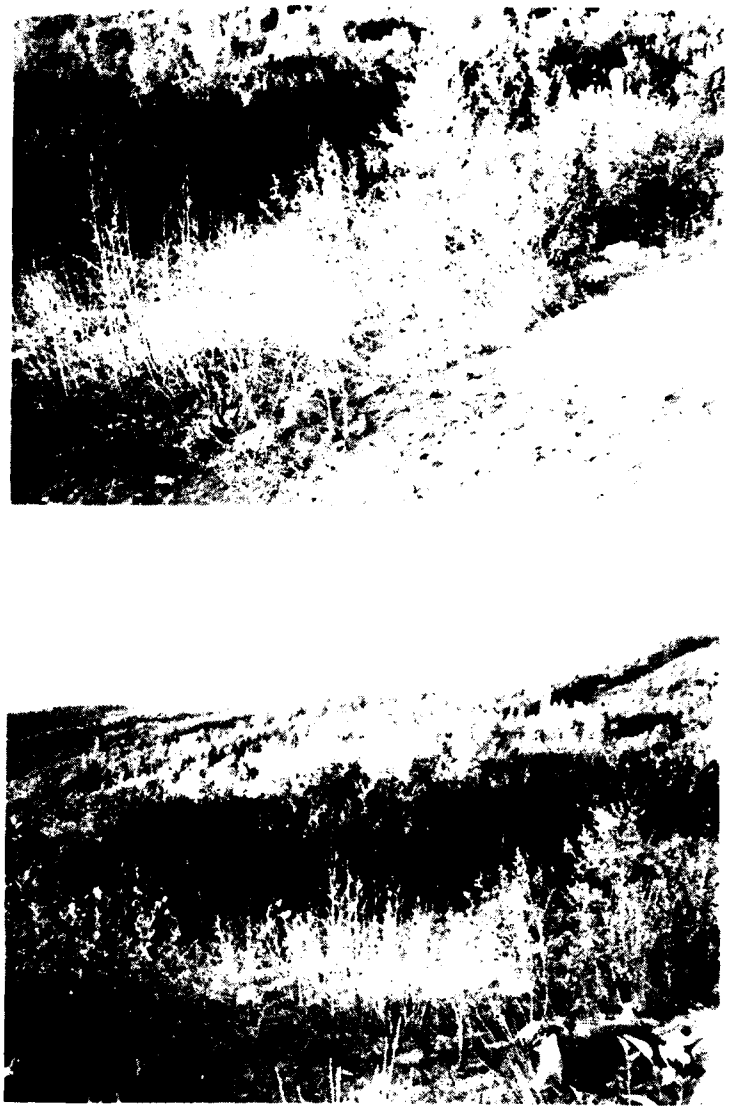
Upper Camp Dump
Tatalina AFB

Figure 4



POL Tank Area
Tatalina AFB

Figure 5



Stressed Vegetation, Site 3
Tatalina AFB

Figure 6

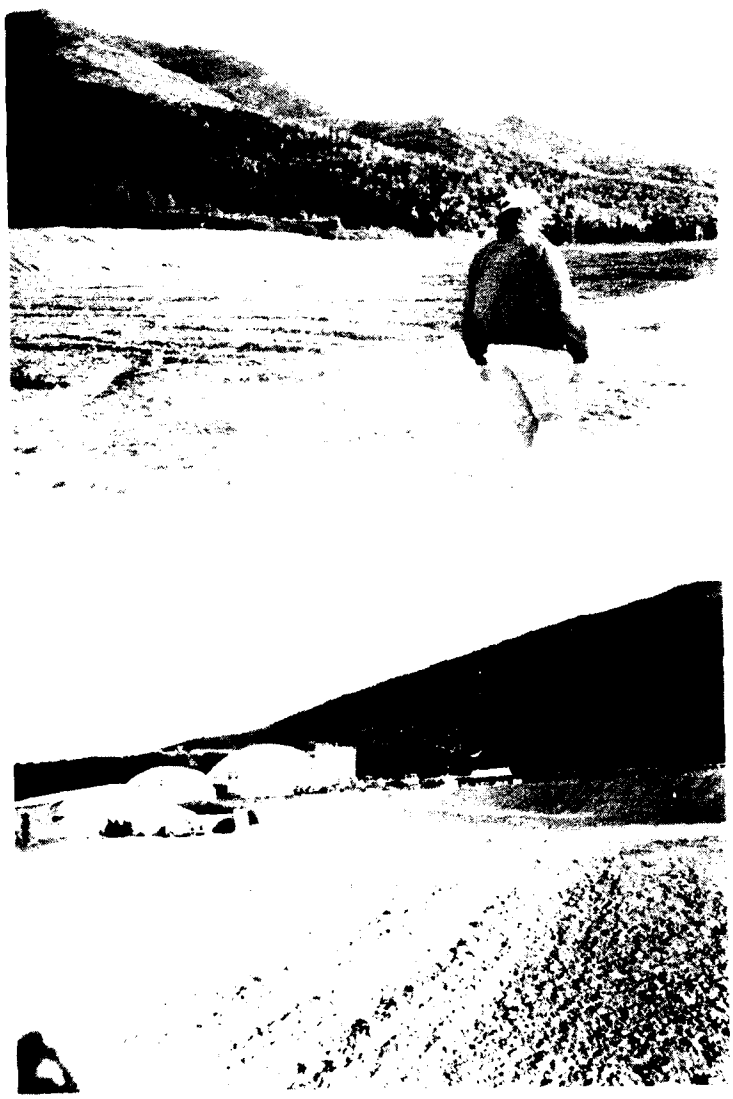
would have migrated further downslope. No evidence of vegetation stress was observed further downslope. A small spill was also reported at a vehicle fueling station at the Lower Camp (site 9). No evidence of a spill remains in the area.

Road oiling in the Lower Camp (site 6) has not occurred since the late 1970s/early 1980s. No evidence of contamination remains.

Two waste accumulation areas (sites 7 and 8) and a contiguous waste accumulation area and landfill (site 10) are located in the Lower Camp. All three sites have been closed. Sites 7 and 8 were associated with the old station complex which has been demolished. The sites were covered with over 1 m of fill, and no evidence of contamination was observed (Figure 7). Site 10 has also been closed and covered over. This landfill is now being used as a playing field.

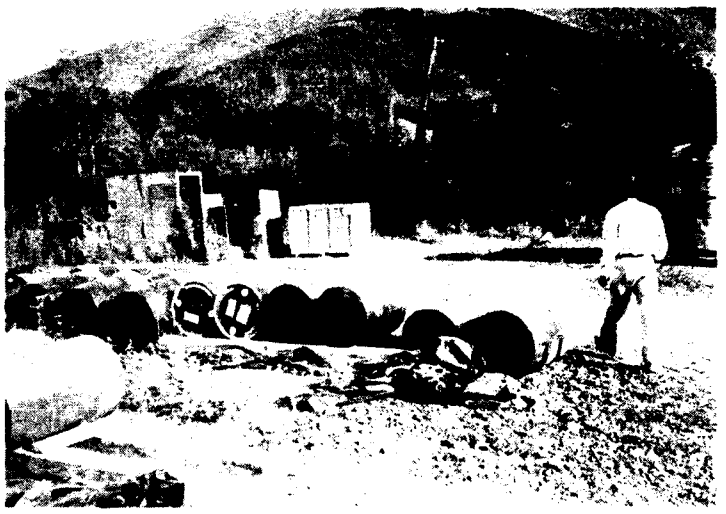
Sites 4 and 11 are the landfill and the active waste accumulation area, respectively. The waste accumulation area has evidence of a few minor spills, seen as dark stained soil one to several feet in diameter. Dozens of barrels are stacked at the area awaiting shipment off base (Figure 8). No vegetative stress was observed in the area. The active landfill exhibited no signs of contamination and appeared to be properly operated.

The survey team also inspected the water gallery at Tatalina AFS (see Figure 9). This was not identified as a "site" in the Phase I report (Eng. Sci 1985).



Waste Accumulation Areas
Tatalina AFB

Figure 7



Active Waste Accumulation Area
Tatalina AFB

Figure 8

Water Gallery Pumphouse
Tatalina AFB

Figure 9

1.4.2 Risk Screening

Environmental and health risks were assessed at the sites identified in the Phase I report. Site 4, the active landfill, was not considered in the report since it is permitted by ADEC. Risk was determined to be negligible at the remaining eleven sites (1-3, 5-12).

1.5 ALTERNATIVES

Alternative actions were considered for all 11 sites at Tatalina AFS. No further action is the preferred alternative at all sites.

1.6 CONSISTENCY WITH ENVIRONMENTAL LAWS

The Tatalina AFS was found to be in compliance with the following environmental laws:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act
- Safe Drinking Water Act

1.7 CONCLUSION

Based on a comprehensive literature search, observations made during a site visit in 1987, information gathered from government regulatory agencies, and the characteristics of suspected or known contaminants, the health and environmental risks at all eleven sites assessed at Tatalina were judged to be negligible to low. An analysis of action alternatives determined that no further action was the preferred alternative for all eleven sites.

2.0 TECHNICAL ATTACHMENTS

2.1 SITE DESCRIPTION

2.1.1 Location

Tatalina AFS is located in the south-central interior of Alaska, 390 km northwest of Anchorage. In this area, the Kuskokwim River flows between the Alaska Range to the east and the Kuskokwim Mountains to the west. Tatalina AFS is located near the eastern flank of the Kuskokwim Mountains near the base of Takotna Mountain (Figure 1). The Tatalina Air Force installation consists of 2030 hectares at latitude 62°53′ North and longitude 156°00′ West. The Kuskokwim and Takotna rivers flow in a southwesterly direction, 18 km east and 7 km west of the installation, respectively. The smaller Tatalina River is located 1.5 km east of the installation airstrip and also flows in a southwesterly direction.

Takotna, a small community located 9 km north of Tatalina AFS, is connected by road to the installation. Takotna has a population of 76, 53 percent of which is Native Alaskan (Community and Regional Affairs 1988). McGrath is a community of 509 (48 percent Native Alaskan), situated 23 km east of the AFS (1987 Municipal Population Report).

2.1.2 Environmental Setting

Tatalina AFS

2.1.2.1 Geology

The eastern flank of the Kuskokwim Mountains and the area extending into the Kuskokwim-Tanana Lowlands is underlain by an extensive series of Cretaceous (60 to 130 million years b.p.) sedimentary rocks. This rock type has been defined and referred to as the Kuskokwim Group (Cady et al. 1965). The Kuskokwim Group represents a marine regression with a deep marine depositional environment of the Early Cretaceous, regressing to shallow marine and non-marine depositional environments of the Middle and Late Cretaceous (Bundtzen and Laird 1980). The Kuskokwim Group consists of graywacke, shale, quartz-rich sandstone, and conglomerates typically about 2100 m deep. Late Cretaceous to Early Tertiary (50 to 70 million years b.p.) plutons, mafic extrusive piles, and complex dike swarms intrude and overlie the sedimentary rocks (Bundtzen and Laird 1980).

This south-central region of Alaska is part of an active mountain building region. Consequently, the bedrock geology is often metamorphosed and/or intruded by plutons. Numerous northeast trending faults are present (Selkregg 1976). Bundtzen and Laird mapped a fault (1980) in the granitic rocks of Takotna Mountain east of the Upper Camp area of the Tatalina AFS. The upthrown side of the fault is defined by the east-facing scarp of Takotna Mountain (Eng. Sci. 1985). Many of the region's rich mineral deposits are associated with granitic plutons. The area surrounding the Tatalina AFS is considered to have rich mineral potential (Selkregg 1976).

The Tatalina Upper Camp is located at the top of Takotna Mountain (Elev. 975 m), which is the top of a granite-diorite pluton (Eberlein et al. 1977). The area is rocky and exposed. A locally absent, thin gravelly residuum overlies the bedrock.

Outcrops of bedrock are common, and permafrost is present at shallow depths (Eng. Sci. 1985).

Geology of the Lower Camp (Elev. 380 m) is dominated by moderately thick, mixed talus and alluvial deposits composed of sand, gravel, cobbles and boulders that have been eroded from upslope regions (Eng. Sci. 1985). The surface residuum which overlies the sedimentary bedrock is probably 7 to 10 meters thick. The thickness of the surface residuum overlying bedrock is probably greater at the airstrip 2 km east of the Lower Camp (Elev. 275 m). This is due to the presence of alluvial deposits from the Tatalina River which flows past the airstrip 1.5 km to the west.

2.1.2.2 Hydrology

Since the installation is situated between two river valleys, the topography in the area of Tatalina AFS is moderate. The Upper Camp area is steepest and is located atop Takotna Mountain at an elevation of 975 m. From the top, the terrain descends to an elevation of 380 m to the Lower Camp over a distance of 1.5 km. Ground elevation at the airstrip is 275 m above mean sea level (msl).

Drainage from Takotna Mountain is radial, extending in outward directions from the top. Most of the runoff from the Upper Camp occurs in a southeasterly direction. A small amount of Upper Camp runoff is directed westward to Beef Steak Creek, a tributary to the Takotna River. The creek's headwaters are located in Roast Beef Gulch about 460 m below the radar site at the Upper Camp (Eng. Sci. 1985, Hulsing 1966). The Lower Camp is located on the southern side of Takotna Mountain. Drainage from the Lower Camp flows southeasterly into an unnamed tributary of the Tatalina River. Runoff from the

airstrip is directed easterly for a short distance and then discharged into the Tatalina River (USGS 1954).

The Upper Camp area surface material is dominated by coarse-gravelly, bouldery residuum overlying bedrock at shallow depths. Ground water may occur seasonally as perched water under water table conditions (Eng. Sci. 1985). The Lower Camp surface materials consist of thick sequences of unconsolidated talus and alluvium. These materials are seasonally highly permeable and receive ground-water recharge from units upslope and from precipitation infiltration. Seasonal discharge is directed downslope to local surface waters (Eng. Sci. 1985). The existence and extent of permafrost at the Lower Camp is uncertain. Permafrost is present at the Upper Camp within a few feet of ground surface (Hulsing 1966). Regionally the area is generally underlain by thin permafrost (<180 meters thick) reported to be present primarily in fine grained sediments (Ferrians 1965).

The current source of drinking water for Tatalina AFS is a gallery system. The gallery consists of a large vertical pipe connected to a large perforated lateral pipe, 7 m below the ground surface. The perforated lateral pipe extends 87 m along the stream course at the Lower Camp. The lateral pipe serves as a "collecting pan" for water percolating into the streambed alluvium. Water is pumped out of the gallery into holding tanks where it is stored for station use (Feulner 1966). The water is tested monthly for total coliform bacteria and treated with chlorine (L. Dean ADEC 1988).

2.1.2.3 Biota

The vegetation habitat type is classified as an upland spruce/hardwood forest (Selkregg 1976). This type of habitat is characterized by white spruce (Picea gauca) with scattered

paper birch (Betula papyrifera). Quaking aspen (Populus tremuloides) are found on moderate south-facing slopes, while black spruce (Picea mariana) is found on northern exposures and poorly drained flat areas (Selkregg 1976). The understory within the forest consists of spongy mosses and low brush on the cool moist slopes, grasses on dry slopes, and willow and alder with dwarf birch in the high open forests near timberline (Selkregg 1976). Common shrubs are willow (Salix spp.), high bush cranberry (Viburnum edule), and rose (Rosa acicularis). Common herbs are bluebell (Mertensia paniculata), fireweed (Epilobium angustifolium), lupine (Lupinus nootkaensis), and twinflower (Linnaea borialis). Two common grasses are bluejoint reed grass (Calamagrostis canadensis) and cottongrass (Eriophorum vaginatum). Sedges (Carex spp.) and rushes (Juncus spp.), as well as various ferns, mosses and lichens, are common in moist areas.

Three plant species which might occur in the McGrath/Tatalina area are under investigation (Category 2) by the U.S. Dept. of Interior for endangered species eligibility. These plants are Smelowskia pyriformis which is a small flowering herb found only at three localities in the upper Kuskokwim River drainage, a type of dandelion (Taraxacum carneocoloratum) found in the upper drainages of the Kuskokwim River, and a type of mustard (Thlaspi arcticum) found in a variety of widely spaced locations around Alaska (Murray 1987). It is not known if they occur within boundaries of the installation.

A great variety of waterfowl seasonally inhabit the Kuskokwim River and the surrounding wetlands. Many species of ducks, geese, cranes, gulls, loons and others migrate to the Central Kuskokwim region. Birds which are found inland from the Kuskokwim River include migratory birds sucn as robins (Turdus migratorius), gray jays (Perisoreus canadensis), chickadees (Penthestes spp.), juncos (Juncos hyemalis spp.), thrushes

(Hyocichla spp.), hawks (Buteo spp.) and falcons (Falco spp.). Some varieties of birds which inhabit the area on a year-round basis include spruce and rufted grouse (Canachites spp.), and rock and willow ptarmigan (Lagopus spp.). There is a distinct possibility that the endangered peregrine falcon (Falco peregrinus) may be found nesting along the river bluffs and cliffs of the Kuskokwim River (EIP for Proposed Yukon-Kuskokwim National Forest Dept. of Interior 1973). However, the Kuskokwim River is 23 km from the main facility at the Tatalina AFS and nesting habitat for peregrine falcons was not found during the 1987 site visit. In addition, reports of the bird's existence at the AFS were not uncovered during this study.

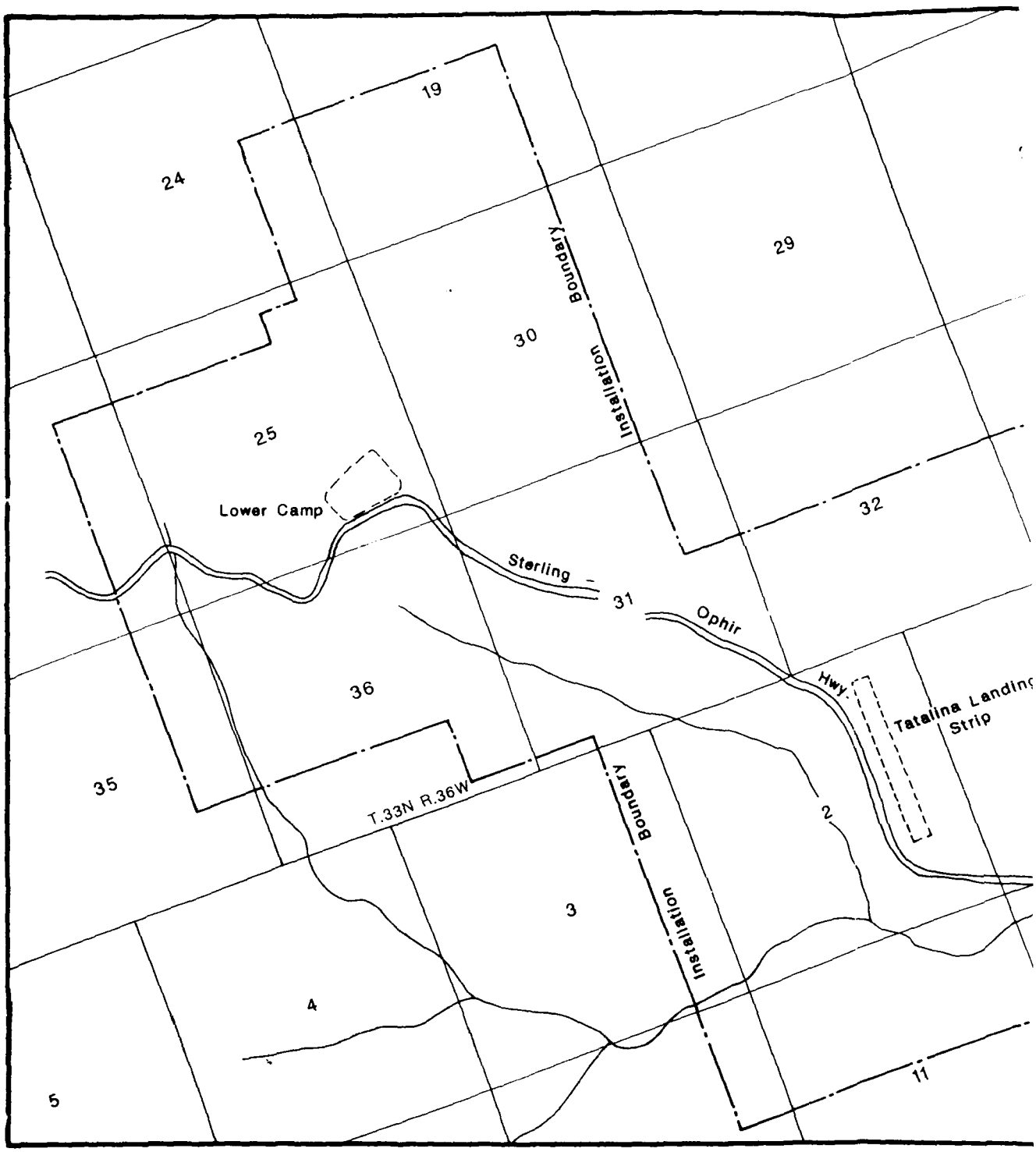
The Central Kuskokwim region provides significant habitat for many large mammals. Three recognized herds of caribou (Rangifer arcticus) inhabit the region. One, the Beaver Mountain Herd, frequents the Kuskokwim Mountains and numbers about 3000 (Dept. of Interior 1973). Moose (Alces alces) are found at lower elevations and in most drainages. Brown bear (Ursus arctos) range through the foothills and mountain valleys and are closely associated with the occurrence of ground squirrels (Citellus parryii), their principal food source. Wolves (Canus lupus) and wolverines (Gulo luscus) range throughout the area. Marten (Martes americana) and beaver (Caster canadensis) are the areas most important commercial furbearers (Dept. of Interior 1983). Smaller mammals such as muskrats (Ondatra zibethicus), snowshoe hares (Lepus spp.), weasels (Mustela spp.) and voles (Microtus spp.) are common in the area. Trapping and hunting are common subsistence and commercial activities in the McGrath area.

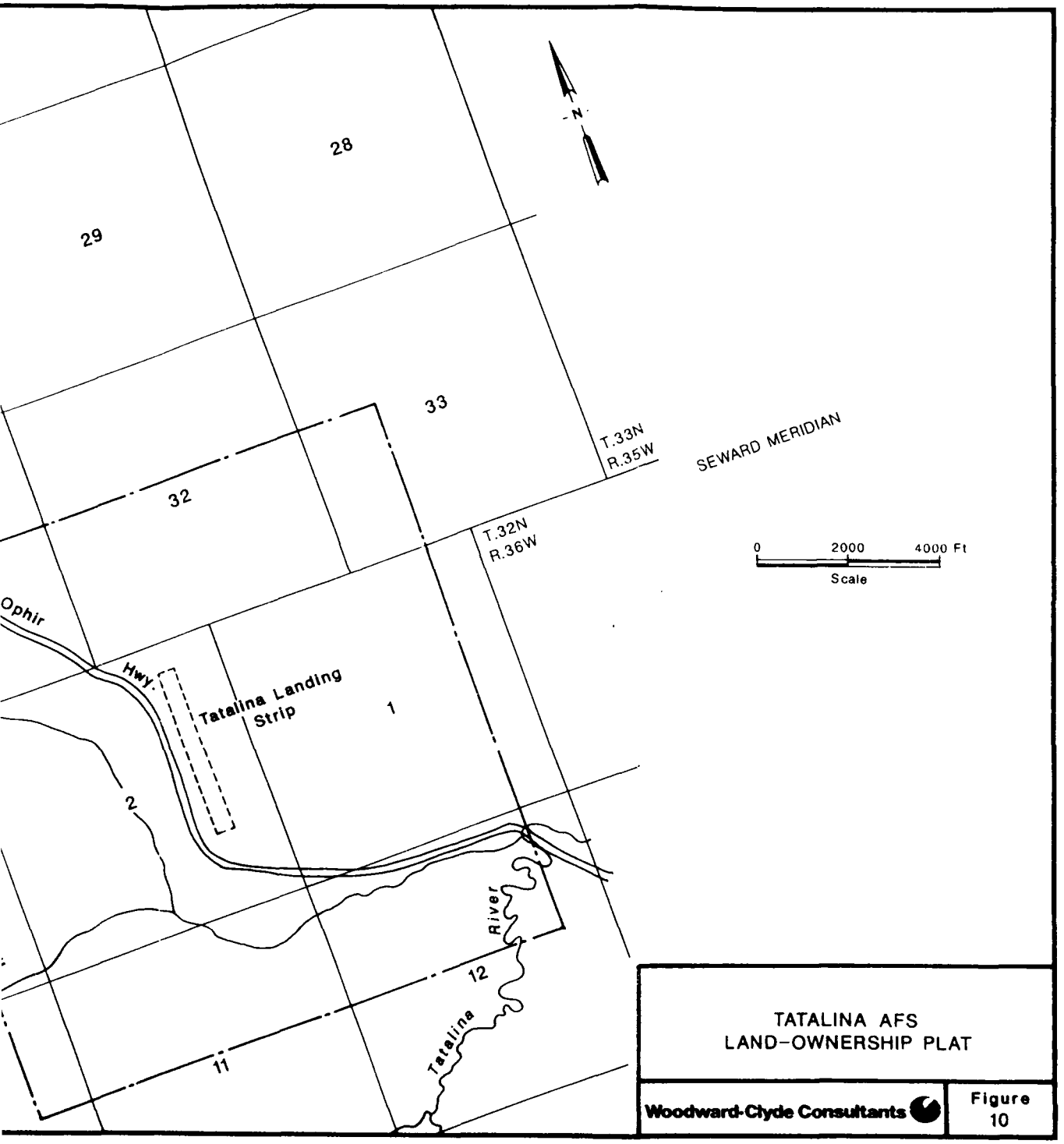
Tatalina AFS

2.1.3 Site History

Tatalina AFS is one of the ten original Aircraft Control and Warning (AC&W) sites constructed in Alaska as part of the Air Defense System. It was originally named Takotna AFS; the name was changed to Tatalina in 1954. Land for the AFS was withdrawn by Public Land Orders (PLO) 731 in 1951, 815 in 1952, and 1740 in 1958. Each of the PLOs withdrew land for Air Force purposes (Figure 10). Tatalina AFS became operational in 1952 with 174 authorized military positions. In 1957, the White Alice Communication System (WACS) was activated near the Upper Camp, replacing the high frequency radio communications system. The WACS was deactivated in 1979 and replaced by an Alascom commercially owned and operated satellite earth terminal. The WACS was demolished and buried by the 5099th Civil Engineering Operations Squadron (CEOS) in 1987. In 1977, RCA obtained a contract with Alaska Air Command (AAC) which eliminated 87 military positions at Tatalina AFS. A Joint Surveillance System (JSS) was installed in 1982, enabling radar and beacon data to be transmitted via satellite to the Elmendorf Regional Operation Control Center (ROCC). The installation of JSS eliminated all military positions and permitted total operation of the radar by RCA personnel. Minimally Attended Radar (MAR) was installed in 1985 and allowed for further RCA staff reductions, to the current 10 civilian positions (Office of History AAC 1983, Eng. Sci. 1985).

The land surrounding the installation has been conveyed to MiNT, Ltd. and Doyon, Limited. Both are native corporations subject to the rights and privileges of ANCSA (Alaska Native Claims Settlement Act). The Sterling Ophir Highway, which extends from the community of Takotna to the Sterling Landing at the Kuskokwim River, runs through the installation. This road has a 30 m Right of Way for private and public use.


19
24
29
30
Installation Boundary
25
Lower Camp
32
Sterling
31
Ophir
Hwy.
Tatalina Landing Strip
36
35
T.33N R.36W
2
3
Installation Boundary
4
11
5



TATALINA AFS
LAND-OWNERSHIP PLAT

Woodward-Clyde Consultants

Figure
10

2.1.4 Site Operations

Tatalina AFS is divided into four active parts: the Upper Camp MAR facility is located on top of Takotna Mountain; the Lower Camp is located at the base of the mountain southeast of the Upper Camp; the airstrip for the AFS is 2 km southeast of the Lower Camp near the Tatalina River; and the Sterling Landing fuel depot is 26 km southeast by road along the Kuskokwim River. All parts of the installation are connected by gravel road. Roads also connect the AFS to the small community of Takotna, 9 km northwest of the Lower Camp. Originally the Upper and Lower Camps were connected by a tramway. The tramway proved unreliable and was dismantled in 1959.

The White Alice site, which has been demolished and buried, was located less than 1 km from the Upper Camp facility atop Takotna Mountain. The MAR Tower is all that remains of the Upper Camp. All other facilities at the Upper Camp were demolished and cleaned up by the 5099th CEOS in 1987. Present facilities at the Lower Camp include the residential dome, industrial dome, sewage lagoon, gymnasium, POL storage area, septic tank and water gallery. The rest of the Lower Camp facilities were demolished, cleaned up, and buried in 1987. The weather tower and fuel storage tanks are located near the airstrip which is 940 m long. Fuel tanks are located at the Sterling Landing where a barge docks once a year to re-supply the installation.

A diesel-burning power plant at the industrial dome provides electricity for the installation. Water is supplied from a gallery-well system. The gallery is a perforated pipe buried within the alluvium of the unnamed creek at the Lower Camp. This pipe collects water where it is pumped out and stored in storage tanks for use by the AFS. The drinking wat.r is

chlorinated prior to use. Waste water is currently treated in a septic system. The standard system for wastewater treatment is the sewage lagoon which is presently deactivated and awaiting restoration. The septic tank is in use temporarily until the sewage lagoon is restored (C. Humphry 1988). The AFS is re-supplied by barge annually. The re-supply barge docks at the Sterling Landing where the supplies are offloaded and trucked 26 km to the main facility. This operation is part of the annual Cool Barge site re-supply (Office of History AAC 1983).

2.1.5 Chemicals Used

Standard operating procedures at Tatalina AFS have the potential to generate hazardous materials. Table 3 supplies a list of hazardous materials on inventory at the installation in 1985. The list was compiled by the operator, RCA. Activities using the items in Table 3 include building construction and maintenance, power plant operation and maintenance, vehicle and aircraft maintenance, water purification, use of solvents for cleaning, heat exchange processes, fuel storage and dispensing, and others.

2.1.6 Previous Studies

The IRP (Installation Restoration Program) was set up as a four-phase program:

Phase I Problem Identification/Records Search
Phase II Problem Confirmation and Quantification
Phase III Technology Base Development
PHASE IV Corrected Action Development

TABLE 3

	Material Name	Container Type
1.	Helium 220 cu	Cylinder
2.	Freon 22 15 lb	Cylinder
3.	Freon 12 50 lb	Cylinder
4.	Freon 12 220 cu 77 lb	Cylinder
5.	Freon 12 440 cu	Cylinder
6.	Acetylene 440 cu	Cylinder
7.	Acetylene 30 lb	Cylinder
8.	Nitirgen 220 cu (oil free)	Cylinder
9.	Nitirgen 220 cu (water pump)	Cylinder
10.	Tablets Sanariel 100 lb	Drum
11.	Propane 40 lb	Cylinder
12.	Flares (36 Hour)	Case
13.	Oil HDO 30 55 gal. unused	Drum
14.	Oil 10W-30 55 gal.	Drum
15.	Antifreeze 55 gal.	Drum
16.	Taluene tech 55 gal.	Drum
17.	Carbon removing comp. 55 gal.	Drum
18.	Oil HDO-10 55 gal.	Drum
19.	Waste oil used mixed 55 gal.	Drum
20.	Hydraulic oil 55 gal.	Drum
21.	CO2 220 cu	Cylinder
22.	Lube oil 5 gal.	Can
23.	Dexton II oil 5 gal.	Can
24.	Sodium hydroxide 100 lb	Drum
25.	Lube oil general 5 gal.	Can
26.	Thinner 5 gal.	Can
27.	Compound solvent 5 gal.	Can
28.	Paint 1 gal. enamel	Can
29.	Paint 1 gal. runway (flo)	Can
30.	Hydraulic oil 5 gal.	Can
31.	Paint Spray	Can
32.	Turpentine 1 gal.	Can
33.	Paint enamel 5 gal.	Can
34.	Calcium Hydrochlorite 100 lb	Drum

Note: These substances are not expected to be found at any Tatalina disposal sites. Hazardous waste materials and substances for retrogradation are transported to Elmendorf AFB. Used oils are containerized to await shipment offsite.

Source: RCA/OMS Tatalina.

Tatalina AFS

Phase I was completed by Engineering Science in 1985 for the Long Range Radar Stations (LRRS). The report divided the LRRS into a northern and a southern region. Tatalina AFS is one of six southern region LRRS sites considered. The Phase I investigations were prepared for the Air Force Engineering and Service Center in 1985.

2.2 CURRENT SITE STATUS

2.2.1 Findings from Previous IRP Studies

Phase I (Eng. Sci. 1985) considered eleven potential contamination areas at Tatalina AFS. A 12th site, the White Alice Station, was determined to have minimal potential to create environmental contamination and was excluded from further discussion (see Table 1 for site descriptions). Sites 1, 2, 3 and 9 are spill/leak sites, sites 5, 7, 8, and 10 are previously used dumpsites or waste accumulation areas, site 6 is an area of Lower Camp road oiling, and sites 4 and 11 are the active landfill and waste accumulation area, respectively. Engineering Science rated the eleven sites as "Follow-up Action Warranted." The Phase I assessment was based on field inspections, file data, interviews, environmental setting and HARM rating scale (see Table 1).

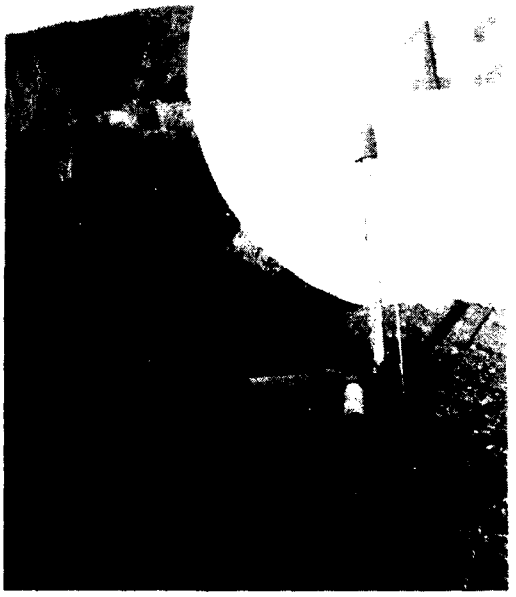
2.2.2 Observations from Site Visit

Tatalina AFS was visited in August 1987 by representatives of the U.S. Air Force and Woodward-Clyde Consultants. The purpose of the visit was to observe current conditions at the eleven potential contamination sites and to evaluate the conclusions of the Phase I report. Ten of the eleven sites described as potential contamination areas in the Phase I report were visited by the team. Site 2, a Sterling Landing fuel depot, was not visited due to access problems. The White

Alice site, determined in Phase I as having no potential for contamination, had been demolished and buried; the area was not visited by the team.

Diesel fuel leaks have occurred near an Upper Camp garage (site 1). One reported leak in 1985 resulted in 500 gallons draining onto the unvegetated rocky soil. An earlier leak at this site (1980s) was reported as being of a larger volume. The garage area was recently demolished and the area covered with fill. The survey team did not observe any remaining contamination. Site 5, consisting of two abandoned dumpsites, is also located at the Upper Camp. Drums, wood, and metal debris were disposed of in the dumps, one located at the top of the mountain and the other several hundred yards downhill. A general clean up of the area occurred in 1984; the debris was buried in nearby pits and the area was graded and backfilled. No evidence of debris or contamination was observed by the site visit team.

Several diesel fuel spills and leaks have been reported at the Lower Camp POL bulk storage area (site 3 Figure 11). The area has a history of periodic losses which usually occur during fuel transfer activities. In 1980, a 1000-gallon spill was reported in the vicinity of Tank 3; the site visit team found no evidence of this spill. Diesel fuel spills also took place near Tank 4. Losses of about 500 gallons each were reported in 1981 and 1982. Again, the survey team did not observe any signs of contamination in the vicinity of the tank. A small area of dead vegetation (30 x 18 m) was observed downslope from Tank 2. Some of the soil exhibited a diesel odor, and the soil closest to the tank smelled of gasoline (MOGAS) which is stored nearby. There are no records of either a spill from Tank 2 or a MOGAS spill in the area. The topography in the area of stressed vegetation is moderately steep, and the soil



Site 3
Tatalina AFB

Figure 11

is sandy. There is no evidence of vegetation stress further downslope.

In 1983, a small spill occurred near the MOGAS fueling station adjacent to the new station complex (site 9). Phase I reports that this area has received routine spillage from the MOGAS fill stand. The site visit team observed that the fueling location is situated on the gravel pad constructed for the new station complex. No evidence of a spill remains.

Road oiling in the Lower Camp (site 6) occurred intermittently from the 1950s through the early 1980s. There have been no recent episodes of this activity. No evidence of contamination remains.

Two waste accumulation areas (sites 7 and 8) and a contiguous waste accumulation area and landfill (site 10) are located in the Lower Camp. Sites 7 and 8 are areas in the old station complex used to accumulate drummed wastes from the power plant and motor pool, respectively. The entire area of the old station complex, including these two waste accumulation areas, was demolished and covered with 1 m of fill. No evidence of any contamination was observed. The waste accumulation area in site 10 operated from the 1950s to 1977. It was cleaned of all stored drums in 1973; no evidence of contamination remains. The landfill section of site 10 was in use from the 1950s to the mid-1960s and covers an area of about 1 hectare. The area fill method was used, and fill depths extend to about 4 m. The landfill has been covered and graded, and is now used as a playing field. No evidence of contamination or debris was observed by the survey team.

The active landfill has been designated as site 4. The landfill is permitted by the Alaska Department of

Environmental Conservation (ADEC) and is, therefore, beyond the scope of this report.

Site 11 is the active waste accumulation area. Waste liquids as well as unused products are stored at this site. Unused, drummed liquids have been stored in this area since the 1950s; the area has been used for accumulation of wastes only since 1977. Evidence of minor spills was observed by the survey team, consisting of dark stains from one to several feet in diameter. The spills appear to consist of oil. In the currently active section of site 11, dozens of barrels are stacked and await shipment off base. Some of the barrels are leaking and others have rolled into the adjacent woods. No evidence of vegetative stress was observed in the area.

Although not designated as a "site" in Phase I, the survey team inspected the water gallery and associated pumphouse at Tatalina AFS. The pumphouse is located down-gradient from the station complex, but is not in the drainage path from any of the eleven sites of potential contamination.

2.2.3 Findings from the Literature Search

Permafrost in the inland region is mostly continuous, restricted to fine-grained sediments to a maximum depth of 180 meters (Ferrians 1965). The area near the Kuskokwim is underlain with isolated masses of permafrost (Ferrians 1965). Hulsing (1966) reports that permafrost was found near the Upper Camp less than 1 meter below the surface. The Sterling Landing is next to the Kuskokwim River. Permafrost near the Kuskokwim is affected by a thawbulb due to the moderation of ground temperatures. It is not known whether continuous permafrost exists at the other areas of the AFS.

Tatalina AFS

Takotna is a small community 9 km northwest of the AFS. The principal economy is fur harvesting and mining. The community has a population of 76, about half of which are Native. Takotna is connected to the AFS by road. Takotna does not share any facilities with the AFS (i.e. water source, sewage treatment facility, landfill, runway). Some economic exchange does occur with the community and RCA personnel from the AFS.

The topography of the Lower Camp is a constant moderate slope with all drainage patterns tending southeasterly. The runway area is moderately level with drainage patterns tending easterly for discharge into the Tatalina River.

Water is provided by means of a gallery buried 8 m under the creek bed alluvium. Water percolates through the alluvium and is collected in a long, perforated pipe. It is pumped into storage tanks for station use. The gallery is located at a slightly lower elevation from the main Lower Camp facility, but on the opposite site of the drainage path. All potential sources of contamination identified in Phase I appear to be located downslope or on the opposite site of the drainage from the water gallery.

Climatic conditions are typical of interior Alaska. Summers are short and warm, winters are long, cold, and dry. Minus 15^{o}F is an average December temperature. Summer temperatures average 50^{o} to 60^{o}F. Average annual snowfall is 216 cm. The total average annual precipitation is 38 cm (National Weather Service).

2.2.4 Consistency with Environmental Laws

2.2.4.1 Resource Conservation and Recovery Act (RCRA)

Subtitle C - Hazardous Waste Management. Defines hazardous wastes and prohibits disposal except in permitted facilities. Tatalina AFS is in compliance with Subtitle C.

Subtitle D - State or Regional Solid Waste Plans. State or regional permits are required for non-hazardous waste disposal facilities. The current landfill (site 4) is not in the scope of this report but is permitted until April 1, 1988 by the Alaska Department of Environmental Conservation at which time the permit must be renewed. The disposal of hazardous substances in the landfill is prohibited by the permit.

2.2.4.2 Clean Water Act

Section 303 - Water Quality Standards and Implementation Plans. This requires water quality standards for all surface waters to be implemented by the states. In Alaska, these have been promulgated by ADEC. There is no evidence state water quality standards are being violated at Tatalina AFS.

Section 311 - Oil and Hazardous Substance Liability. Accidental or intentional discharges of oil and hazardous substances are regulated. Some residual evidence of an unknown gas or diesel spill was noted at the tank storage area by the survey team during the 1987 site visit. However, the area did not drain into the nearby creek nor was there evidence of sheen upon

nearby surface waters. No other reported spill sites exhibited any residual evidence. Therefore, the station is in compliance with Section 311.

Section 404 - Permits for Dredged or Fill Material. Modifications to the wetlands require a Discharge of Dredged or Fill Material Permit from the Army Corps of Engineers. Tatalina AFS is not considered a wetland, therefore no 404 permits are required.

2.2.4.3 Safe Drinking Water Act

Section 1412 - National Drinking Water Regulations. It is unlikely that drinking water standards as promulgated by the Safe Drinking Water Act (SDWA) will be exceeded by potential contamination at Tatalina AFS.

Section 1413 - State Primacy Enforcement Responsibility. The State of Alaska has assumed primacy for enforcement of the SDWA. The water supply at Tatalina AFS is classified as class C (serving 25 persons or less). A permit is not required nor is monitoring. However, the installation routinely monitors for total coliform bacteria and submits results to ADEC. The water supply is Public Water Supply No. 280105.

2.3 POTENTIAL CONTAMINANTS

2.3.1 Spill/Leak Nos. 6 and 7 - Upper Camp (Site 1)

These diesel fuel spills of 500-1000 gallons each occurred near the Upper Camp garage. The garage has been demolished and the area covered with fill. Although the area had been assigned a HARM rating of 69 during the Phase I study, no

evidence of contamination remained during the 1987 site visit. For this reason, no further action is considered warranted.

Diesel fuel has a toxicity rating of 3, corresponding to a moderately toxic level. This rating is based on a toxicity scale of 1-6; a rating of 1 being practically non-toxic, and 6 being super toxic (Gosselin, 1984). The components of diesel are virtually insoluble in water. Diesel is derived from the middle distillates of crude petroleum, being composed of hydrocarbons in the C_{12} to C_{25} range, with a predominance of 15 to 17 carbon atoms. Diesel fuels typically contain about 30 percent paraffins, 45 percent naphthenes, and 25 percent aromatics. Specific gravities of pure product are between 0.80 and 0.85. Its volatility is lower than that of lighter fuels such as gasoline. Consequently, while many of the lower molecular weight hydrocarbons have probably volatilized in the last 3-4 years, other components may have remained in the soil.

2.3.2 Spill/Leak No. 8 (Site 2)

This site is one of routine diesel fuel leaks and spills at the Sterling Landing. The site was assigned a HARM rating of 66 during the Phase I study, but was not visited in 1987 due to access problems. These minor leaks and spills are not considered significant and no further action is warranted.

2.3.3 Spill/Leak Nos. 1,2,3 and 4 - Lower Camp (Site 3)

This is the site of 4 POL storage tanks in the Lower Camp area. Spill volumes range from 500-1000 gallons of POL products, none of which has been recovered. Spill records indicate that in 1980 a 1000 gallon spill occurred at Tank 3; in 1981 and 1982 approximately 500 gallons each were spilled near Tank 4; and in the 1970's several hundred gallons of

diesel were spilled from a storage tank and drained to the vicinity of the POL bulk storage tanks. The soil in vegetated areas downslope of site 3 smelled of gasoline and diesel. However, there was no evidence of vegetative stress further downslope.

Toxicity data for diesel fuel has been presented in section 2.3.1 (above). Toxicity data for gasoline is provided below.

Gasoline, kerosene, and fuel oils in general are given a toxicity rating of 3. This corresponds to a moderately toxic rating, with a probable oral lethal dose to humans of 0.5-15.0 gm/Kg. The toxicity level of any given fuel is usually based on the content of benzene and other aromatic hydrocarbons, so these parameters must be known in order to adequately classify their toxicity levels. Threshold limit values have been established for gasoline and are given below:

Time-Weighted Average (TWA)		Short Term Exposure Limit (STEL)	
ppm	mg/m3	ppm	mg/m3
300	900	500	1500

2.3.4 Dump Areas - Upper Camp (Site 5)

Two dump sites are included in site 5. One is located near the top of the mountain, and the other is several hundred yards downhill. Both dump sites have been cleaned, graded, and backfilled, with no evidence of contamination or spills remaining. Although this site was assigned a HARM rating during the Phase I study, no further action is considered warranted during Phase II.

2.3.5 Road Oiling (Site 6)

Road oiling at the Tatalina site occurred from the 1950's to the 1980's. Waste oils were applied to the roads as a dust palliative and for disposal purposes. Until recently, the practice of road oiling to control dust was an accepted practice throughout the United States. Oils used in this manner do not release hazardous materials into the environment because waste oils do not contain more than trace amounts of hazardous materials. Surface disposal of oil brings the oil into contact with organisms which readily biodegrade most petroleum hydrocarbons, leaving small amounts of weathered insoluble and immobile materials.

There was no evidence of contamination found on or along the roads during the 1987 visit. No dark staining was apparent on or along the roadways.

2.3.6 Waste Accumulation Areas Nos. 3 & 4 - Lower Camp (Sites 7 and 8)

These two waste accumulation areas are contiguous and located in the Lower Camp area. These areas were in operation from the 1950's to 1984 and were covered with fill material in 1987. Sites 7 and 8 were used to store drummed waste oils and motor pool wastes. Although minor leaks and spills have been reported in the past, no evidence of contamination existed during the 1987 site visit. No further action is therefore recommended for this site.

2.3.7 Spill/Leak No. 5 (Site 9)

Several minor MOGAS spills have been reported at the truck fill stand adjacent to the new station complex. None of the spilled fuel was recovered, but was reported to have percolated into the soil. Although the site was assigned a HARM rating during the Phase I study, no evidence of a spill remains, and no further action is considered warranted. Specific MOGAS toxicity data is given in Section 2.3.3.

2.3.8 Waste Accumulation Area No. 2 and Landfill No. 1 - Lower Camp (Site 10)

These contiguous areas were in use from the 1950's to 1977. Reportedly, minor spills and leaks from drummed wastes occurred during site operations. The area was cleaned of all stored drums in 1973, and filled to a depth of 4 meters. The landfill has been covered and graded and no contamination remains at the site. Therefore, no further action is considered warranted for site 10.

2.3.9 Waste Accumulation Area No. 1 - Lower Camp (Site 11)

This is the currently active waste accumulation area for the installation. Drummed liquids have been stored here since the 1950's, with some reportedly leaking. Evidence of spills were dark stains up to several feet in diameter, which appeared to be oil. No evidence of vegetative stress was apparent during the 1987 site visit. Toxicity/contaminant data for diesel fuel is presented in section 2.3.1, and for gasoline and fuel oils in general in section 2.3.3.

2.3.10 White Alice Site (Site 12)

This site is mentioned in the Phase I report but is not considered in Phase II. The site has been demolished and buried in 1987. There have reportedly been oil spills and leaks during site operations. Since site 12 is outside the scope of this report, it will not be addressed further.

2.4 CONTAMINANT MOVEMENT

Of the 11 potential hazardous waste sites identified at Tatalina AFS, only sites 1, 3, 9, and 11 are addressed in this section. Follow-on action is considered unwarranted at sites 2, 5, 6, 7, 8 and 10 due to lack of confirmatory evidence of contamination. Site 4 is currently permitted by ADEC and is therefore outside the scope of this report. Site 12 (White Alice Site) has been demolished and is no longer applicable to this report.

2.4.1 Spill/Leak Nos. 6 and 7 - Upper Camp (Site 1)

Sites 6 and 7 are areas of 500 and 1000 gallon diesel spills, respectively. Since the areas were covered with fill and no evidence of contamination exists it is unlikely that the spills were of sufficient quantity to impact tributaries to the Takotna River. The fate of diesel fuel in the environment is provided below.

Diesel fuel is relatively insoluble in water. Furthermore, adsorption of diesel fuel constituents on organic soils can be significant. Thus, once fuel is spilled, especially on soil with high humic content such as the peats in Alaskan tundra, migration is unlikely except where hydraulic gradients are sufficiently steep. Once infiltration has taken place, lateral migration is negligible because of the hydrophobic

characteristics of petroleum compounds typical in diesel, and the adsorptive capacity of humic soils.

Because of the low volatility of diesel fuel, particularly after many years of weathering, air transport of hazardous substances from a spill is not a significant concern. Biodegredation and chemical transformations, as well as physical processes such as volatilization and differential adsorption on soils, will occur in fuel spills. The possible exposure to environmental receptors is negligible, and generally human exposure to hazardous levels is possible only through direct ingestion of contaminated soils.

2.4.2 Spill/Leak Nos. 1,2,3 and 4 - Lower Camp (Site 3) and Spill/Leak No. 5 (Site 9)

Site 3 contains the POL bulk storage tanks at the Lower Camp area. This site has a history of diesel fuel spills, although soils in the stressed vegetation areas downslope of the site exhibit both diesel and gasoline odors. No evidence of contamination was observed in the immediate vicinity of the tanks. Site 9 was the site of a small MOGAS spill in 1983, adjacent to the station complex. No evidence of that spill was observed during the site visit. A discussion of the environmental fate of diesel fuel is given in section 2.4.1 (above). The fate of other petroleum products is discussed below.

Petroleum products such as gasoline, kerosene, and aviation gas undergo alterations from physical, biological, or chemical processes occurring over time frames ranging from days to years. The magnitude of transformation increases with time. Although the biodegredation and physical processes proceed at slower rates in the arctic than in warmer climates, a substantial change in composition of materials is likely to

have occurred during the last several years. Evaporation and dissolution are important physical processes. In addition, photochemical and microbial oxidations are possible.

Weathered petroleum products generally exhibit the following characteristics:

- Loss of low boiling hydrocarbons from evaporation.
- Loss of low boiling hydrocarbons from dissolution.
- Increase in relative proportions of naphthenic compounds.
- Increase in relative proportions of highly branched alkylated compounds from biodegredation relative to straight chain compounds.
- Increase in relative proportions of polycyclic compounds relative to saturated compounds.

As petroleum hydrocarbons age or weather, the most persistent compounds, polycyclic aromatic hydrocarbons, remain the longest. These compounds may be slowly removed by biodegredation, biotransformation, photolytic, or oxidative processes.

The rate of biodegredation of the weathered petroleum hydrocarbons slows substantially as the molecular weight increases. For instance, naphthalene has a half-life of 5 hours under controlled microbial transformation experiments. Under the same conditions, benzo[a]pyrene will require 21,000 hours to degrade by one half. The relative mobilities of these two materials show a similar relationship. Naphthalene

is much more mobile than the more complex ring system of benzo[a]pyrene.

Given the fact that the drainage of the Lower Camp flows southeasterly and away from the water gallery, the drinking water supply for the installation would not be affected from previous spills.

2.4.3 Waste Accumulation Area 1 - Lower Camp (Site 11)

This is the current waste accumulation area for storing drummed wastes. Some of the barrels were reportedly leaking during the 1987 site visit, although these were awaiting shipment off base. The spills at the site appeared to consist of oil, some being several feet in diameter. No vegetative stress was apparent. Contaminant movement for diesel and other petroleum products is discussed in sections 2.4.1 and 2.4.2 (above). Because the water gallery system is upgradient of site 11 it cannot be affected by the minor spills or leaks from drummed wastes in this area.

2.5 QUALITATIVE RISK SCREENING

2.5.1 General Approach

This is a qualitative risk screening of contamination at Tatalina. The screening is qualitative because it relies on field observations and indirect data evaluations rather than direct and quantitated field or laboratory measurements. Many quantitative methodologies for risk screening are available ranging from statistical probability evaluations to numerical rating systems. However, an initial qualitative screening is necessary to justify the expense and effort necessary to satisfy the data requirements of quantitative approaches. The purpose of this section is to provide that initial screening.

2.5.2 Definition of Risk

Risk is "the probability that a consequence of defined magnitude will occur." The three key concepts of this definition are probability, consequence and defined magnitude. Each is discussed below:

- Probability - According to the above definition of risk, the mere presence of a hazardous substance at a site does not constitute significant risk; risk is the probability of adverse effects to humans or other receptors exposed to the hazardous substance. When that probability is negligible, risk will be considered to be negligible. Conversely, when that probability is not negligible, identifiable risks will be assumed to be present. Thus, probability is evaluated qualitatively rather than quantitatively in this document.

- Consequence - A consequence is an adverse effect on a receptor(s) caused by exposure to oil or hazardous substances. Receptors can be human or environmental resources. Environmental receptors include surface water, ground water, air, soils, vegetation or wildlife. For a receptor to be adversely affected by a contaminant, three general conditions must be met. First, contamination must be present in the environment. Second, the receptor must be exposed to that contaminant. Exposure is a function of contaminant release mechanisms, paths of migration, and chemical fate processes. Third, adverse effects are possible only if receptors are exposed to sufficient quantities of a contaminant and for sufficient intervals of time. This third condition introduces the concept of effect threshold, or the level of exposure necessary to cause an effect. For thresholds to be exceeded, toxicity of contaminants must be

sufficiently high, their quantities or concentrations sufficiently large, and the durations/frequencies of contact with receptors sufficiently long to cause adverse impacts. The assessment procedure used here estimates the qualitative probability of these three conditions being present at a site.

- Defined Magnitude - What constitutes an adverse effect must be established. That is, the magnitude of effect necessary to qualify as adverse or as a consequence must be defined. In general, for an effect to be considered adverse, it must be of sufficient magnitude to create health hazards, cause exceedences of environmental and health standards or regulations, or lead to significant environmental perturbations.

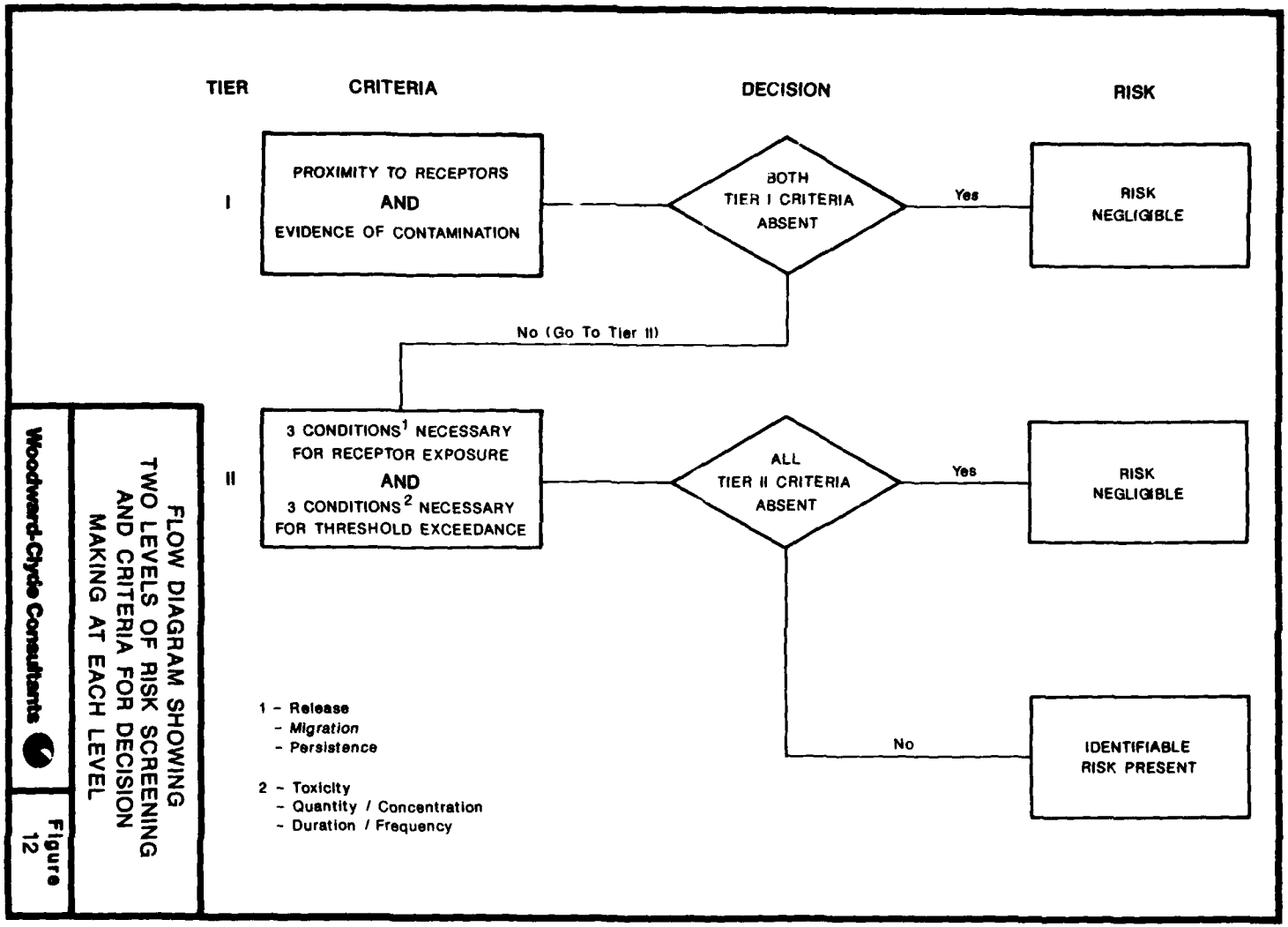
2.5.3 Specific Approach

By the above definition, risk can be either negligible, or present. For those sites assigned a known negligible risk, no further action will be recommended. For sites where potential risks are present, a preferred remedy will be selected from two or more alternatives. One of these alternatives may be "No Further Action." For no further action to be recommended at a site that has identifiable risks, one of the following conditions must be met:

- the hazards created by remedial action or further study out-weigh those presently existing at the site, with no further action, or

- the cost of remedial action or further study is not cost effective.

For the purposes of assigning risk levels to a site, a two-tiered hierarchical decision scheme is employed (see Figure 12). At tier I, an initial screening of the presence of contaminants and the proximity of sensitive receptors is made. This determination is made by reviewing historical records, observations from the site visit, or other evidence. If the available evidence does not indicate that contaminants have been released at the site and if the site is not close to sensitive receptors, then the probability of risk is considered negligible. In this case, a no further action alternative will be recommended. However, if it is concluded that the site is, or possibly has been, contaminated with hazardous or toxic substances, or if the site is in close proximity to sensitive receptors, then screening proceeds to tier II. The approach to tier II is deductive. First, receptors and the conditions necessary for exposure must be identified. Second, the conditions necessary for exceedences of thresholds must be established. Then the actual conditions at the site are compared to the specified conditions. In actuality, all the specified conditions must be present for significant risk to exist. However, the risk screening procedure used here is conservative in that it assumes a negligible risk only if all the conditions are absent. If all the necessary conditions are absent, then a negligible risk is clearly deduced. Likewise, if the status of a specified condition cannot be determined at a site but there is no reason to suspect that it exists, and all other conditions are absent, the site will be assumed to have negligible risk. If one or more of the conditions are present or suspected, then the site represents some identifiable level of risk.



FLOW DIAGRAM SHOWING
TWO LEVELS OF RISK SCREENING
AND CRITERIA FOR DECISION
MAKING AT EACH LEVEL

Woodward-Clyde Consultants

Figure
12

2.5.4 Logic Supporting the Assessment

Prior studies identified 11 sites at Tatalina to have the potential to be contaminated with various wastes. However, during the 1987 site visit only sites 3 and 11 showed any visible signs of contamination. The site 4 landfill is permitted by ADEC and is outside the scope of this report. No visible evidence of contamination was observed at sites 5,6,7,8,9, and 10. The White Alice Site (site 12) was mentioned during Phase I but has since been demolished and is not addressed here. For areas of known spills or leaks (sites 1 & 2) the potential hazards and conditions necessary to produce them were identified. The conditions necessary to allow exposure of receptors to threshold levels of contaminants are listed in Table 4. Finally, conditions at the site were compared with hypothetical "necessary conditions." Table 4 summarizes the conclusions of the risk screening. The rationale for the probability screening of sites 1,2,3 and 11 are discussed in detail below.

TABLE 4

RISK SCREENING FOR TATALINA SITES
TIER I SCREENING - EVIDENCE OF CONTAMINATION AND RECEPTORS

TIER 1 CRITERIA	Site 1	2	3	5	6	7
Is Site in Close Proximity to Sensitive Receptors?	NO	YES	NO	NO	NO	NO
Is Evidence of Contamination Present at Site?	NO	UNKNOWN	YES	NO	NO	NO
Both Criteria Absent?	YES	NO	NO	YES	YES	YES
Risk	NEGLIGIBLE	Go to Tier II	Go to Tier II	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

TABLE 4 cont.

RISK SCREENING FOR TATALINA SITES
TIER I SCREENING - EVIDENCE OF CONTAMINATION AND RECEPTORS

	Site					
TIER 1 CRITERIA	8	9	10	11		
Is Site in Close Proximity to Sensitive Receptors?	NO	NO	NO	NO		
Is Evidence of Contamination Present at Site?	NO	NO	NO	YES		
Both Criteria Absent?	YES	YES	YES	NO		
Risk	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	Go to Tier II		

TABLE 4 cont.

TIER II SCREENING - EVIDENCE OF CONDITIONS NECESSARY FOR A CONSEQUENCE OF DEFINED MAGNITUDE

TIER II CRITERIA	Site					
3 Conditions Necessary for Receptor exposure:	2	3	11			
Significant Release Mechanisms	NO	NO	NO			
Significant Migration Pathways	NO	NO	NO			
High Persistence	NO	UNKNOWN	NO			
3 Conditions Necessary for Threshold Exceedances:						
Moderate to High Toxicity Relative to Receptors and Likely Routes of Exposure	NO	NO	NO			
Quantity/Concentration Sufficient to Exceed Env., Health, Toxicity Standards	NO	NO	NO			
Duration and Frequency of Exposure Sufficient to Cause Adverse Health/Env. Effects	NO	NO	NO			
All Criteria Absent or Unknown?	YES	YES	YES			
RISK	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE			

2.5.4.1 Spill/Leak Nos. 6 and 7 - Upper Camp (Site 1)

These are sites of 500-1000 gallons of spilled diesel fuel. Since there was no visible sign of contamination during the 1987 site visit and the area is not in close proximity to sensitive receptors, a tier I screening only was performed. A negligible risk was assigned at tier I and no further action is considered warranted.

2.5.4.2 Spill/Leak No. 8 (Site 2)

This site at the Sterling Landing is one of routine minor diesel fuel leaks and spills. The site was not visited in 1987 due to access problems, but was screened at tier II due to its proximity to the Kuskokwim River. The following assessment of conditions necessary for adverse effects is an evaluation of the potential for receptors to be significantly exposed to contaminants.

- Release Mechanisms - The contaminants could be released from their present location by volatilization, by mobilization with solvents, or by mechanical transport of affected soils as a result of intentional human disturbances or erosion. Volatilization in significant amounts is unlikely because of present chemical/physical characteristics of the fuel and low mean annual temperatures. A large solvent spill would be required to solubilize components in the diesel spill and to transport them off-site. This is an unlikely event.

- Migration Pathways - Ingestion of contaminated soil by humans is unlikely. The major pathway to human exposure is by air transport. However, the volatile fractions of the spill have volatilized by now and accumulations of threshold air concentrations are unlikely. Other

potential pathways to human and environmental receptors include surface or subsurface migration into surface and ground waters. Since the site is underlain by shallow permafrost, little to no vertical migration can be expected, particularly because of the insolubility of the remaining diesel fractions and their relatively high soil adsorptivities. Migration to surface waters may have occurred but any minor amounts spilled will have been dispersed downstream of the community of McGrath.

- Persistence - The minor quantities of diesel spilled at site 2 is such that significant weathering, chemical transformation, and biodegredation have probably already taken place and will continue. The volatile lower molecular weight compounds, which are the most soluble, would have largely volatilized by now. The potential contaminants in their present location cannot be characterized as persistent.

- Toxicity - Diesel fuel has been assigned a toxicity rating of 3, corresponding to a moderately toxic level. If ingested, it would be expected to have moderate to high toxicity. The possibility of ingestion, however, is unlikely. Toxicity to aquatic species is not significant because diesel fuel components are relatively insoluble in water. Standard action levels for diesel spills in soils do no exist.

- Quantity/Concentration - The reported spillage is routine spills during fuel transfers. This is not of sufficient quantity to pose a hazardous impact to aquatic receptors.

- Duration and Frequency of Exposure - Surface waters of the Kuskokwim River may have been exposed to contaminants from the spill. It is improbable that humans would be

exposed to toxic concentrations of contaminants either orally, dermally, or through respiratory routes. If exposure occurred, it would be of short duration and very infrequent.

It is concluded that there is a negligible probability of significant exposure of receptors to diesel fuel at site 2. No further action is recommended.

2.5.4.3 Spill/Leak Nos. 1,2,3 and 4 - Lower Camp (Site 3)

This is the site of several leaks from POL storage tanks. Vegetation downslope of the site smelled of petroleum products, and a small area of dead vegetation was found downslope of Tank 2. Site 3 is downgradient of the water gallery system and so spillage or leaks from the POL tanks will not affect this potential receptor. Spill volumes from the site range from a few to 1000 gallons of POL products, none of which have been recovered. A tier II screening was done for site 3 due to visible signs of contamination. The following assessment of conditions necessary for adverse effects is an evaluation of the potential receptors to be significantly exposed to contaminants.

- Release Mechanisms - The contaminants in POL products could be released from their present location by volatilization, mobilization with solvents, or by mechanical transport of affected soils. Gasoline products are highly volatile and any volatilization that is possible would have occurred by now. Additional volatilization in significant amounts is unlikely due to the relatively low mean annual temperatures. A large solvent spill would be required to solubilize the remaining components in the spilled contaminants. This is an unlikely event.

- Migration Pathways - Ingestion of contaminated soil by humans is unlikely. The major pathway to human exposure is by air transport. However, the volatile fractions of the spill have volatilized by now and accumulations of threshold air concentrations are unlikely. Other potential pathways to environmental receptors include surface or subsurface migration into surface and ground waters. Since the site is underlain by shallow permafrost, little to no vertical migration can be expected.

- Persistence - The age of the spill at site 3 is such that significant weathering, chemical transformation, and biodegredation have probably already taken place and will continue. The volatile lower molecular weight compounds, which are the most soluble, would have largely volatilized by now. The potential contaminants in their present location can be characterized as moderately persistent.

- Toxicity - Gasoline products in general have been assigned a toxicity rating of 3, corresponding to a moderately toxic level. If ingested, it would be expected to have moderate to high toxicity. The possibility of ingestion, however, is unlikely. Standard action levels for petroleum spills in soils do not exist.

- Quantity/Concentration - The reported spillage was 1000 gallons on one occasion, and 500 gallons on two occasions. This was apparently of sufficient quantity to pose a hazardous impact to vegetative receptors, but the affected area was relatively small (100x60 ft.)

- Duration and Frequency of Exposure - Vegetation downslope of the site has been exposed to contaminants from the

spill. It is improbable that humans would be exposed to toxic concentrations of contaminants either orally, dermally, or through respiratory routes. If exposure occurred, it would be of short duration and very infrequent.

It is concluded that there is a negligible probability of significant receptor exposure to POL contaminants at site 3. No further action is recommended.

2.5.4.4 Waste Accumulation Area No. 1 - Lower Camp (Site 11)

This is a currently active waste accumulation area for storing drummed liquids. Minor evidence of prior leakage was evident in small (several feet in diameter) darkly stained areas which appeared to be oil. Although no potential receptors exist near site 11 and no vegetative stress was observed, a tier II screening was performed due to evidence of contamination at the site. The following assessment of conditions necessary for adverse effects is an evaluation of the potential receptors to be significantly exposed to contaminants.

- Release Mechanisms - Oils could be released by mobilization with solvents or by mechanical transport of affected soils. A large solvent or fuel spill would be required to solubilize non-polar hydrocarbons and to transport them into surface or ground waters. This is improbable. Given the moderate amount of precipitation, any water soluble compounds have probably been leached from the soil. Others with higher adsorption coefficients would tend to remain in the soil. Intentional or erosive movement of soil is unlikely.

- Migration Pathways - Ingestion of contaminated soil by humans is unlikely. Due to the age of possible

contamination, mobilization would be improbable and the existence of migration pathways extremely limited.

- Persistence - Oil is not persistent in the environment. It is subject to weathering, chemical transformation and biodegredation.

- Toxicity - Oil is not toxic unless ingested in large quantities.

- Quantity/Concentration - There is no evidence of the volume of oil spilled. The lack of visual evidence of significant contamination indicates that minimal quantities were spilled.

- Duration and Frequency of Exposure - It is improbable that humans would be exposed to toxic concentration of contaminants either orally, dermally, or through respiratory routes. If exposure occurred, it would be of short duration and infrequent.

It is concluded that there is a negligible probability of significant exposure of receptors to contaminants at site 11. No further action is considered warranted.

2.6 ALTERNATIVES ANALYSIS

2.6.1 Purpose

The Comprehensive Environmental Response and Compensation Liability Act (CERCLA, as amended by the Superfund Amendments and Reauthorization Act--SARA) governs federal agency response to contamination of federal facilities by oil or hazardous substances. The National Contingency Plan (40 CFR 300) calls for cost-effective remedies to be implemented for sites where

a significant risk to human health or the environment is shown to exist. Such sites are enrolled on the "National Priority List" (called NPL). Guidance for selecting cost-effective remedies for NPL sites is available in EPA documents EPA/540/G-85/003, "Guidance for Feasibility Studies Under CERCLA" and EPA memorandum "Interim Guidance on Superfund Selection of Remedy" (Porter, 10/24/86). No specific guidance exists for selecting cost-effective remedies for non-NPL sites such as those at Tatalina. The alternatives analysis presented in the following paragraphs is modeled after the above-referenced EPA guidance, and it is in compliance with the requirements of the National Contingency Plan.

2.6.2 Evaluation Criteria and Method

EPA directives, ("Guidance for Feasibility Studies Under CERCLA and Guidance on Superfund Selection of Remedy) provide an evaluation method for alternative remedies that includes the following evaluation criteria:

- Remedies must be protective of human health and environment;
- Remedies should attain Federal and State public health and environmental requirements;
- Remedies must be cost effective; and
- Remedies must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible.

To meet these standards, the following evaluation criteria are presented:

- Performance level (how effective will the alternative be in abating the hazard, and in reducing risk);
- Useful life (how long will the alternative last);
- Risk of increased exposure (will the alternative create new opportunities for receptors to be exposed to contaminants);
- Environmental impact (will the alternative cause disturbance or loss of environmental resources);
- Cost (Rough, Order-of-Magnitude cost is used: is the economic cost of the alternative low, moderate or high);
- Implementability (what infrastructural, administrative or logistic requirements does the alternative have);
- Institutional impacts (does the alternative place a burden on local community institutions);
- Socioeconomic impacts (does the alternative affect employment, housing, or other socioeconomic factors);
- Safety (what is the health risk to site workers and surrounding residents of the alternative remedial measure);
- Reliability (what are the maintenance, inspection and replacement requirements of the alternatives).

The last four evaluation factors are not specifically addressed in the evaluation below for the following reasons: institutional factors are not relevant because no local community institutions or interactions are involved;

socioeconomic impacts are not relevant because the sites are not economically interactive with local communities; the remedial alternatives considered are relatively specialized and would not present employment or income opportunities to local communities.

Safety impacts are not relevant because none of the known or potential contamination problems or alternative actions present a significant risk to workers or residents of the sites. Reliability is generally not a relevant factor because none of the alternatives are active treatment systems or have any maintenance or replacement requirement. Finally, these factors are not specifically addressed and indirectly considered in the other factors. For example, reliability is partially considered under Useful Life and Performance Level.

The first six evaluation factors (described above) will be applied to each alternative at each site, using a tabular format with the following headings:

- Alternative;
- Performance Level;
- Useful Life;
- Risk of Increased Exposure;
- Environmental Impact;
- Rough Order of Magnitude (ROM) Cost;
- Implementability.

The alternatives will be ranked based on a qualitative scoring that considers performance level, useful life and risk of increased exposure to be relatively more important than environmental impact. Environmental impact will be considered to be relatively more important than ROM cost and implementability.

2.6.3 Alternatives to be Evaluated

At least three alternative actions were considered at each of the three sites evaluated at tier II in the risk screening. These sites were evaluated at tier II because of the proximity of the sites to the Kuskokwim River or the existence of contaminant evidence. These alternative actions are presented below for each of the three sites.

2.6.3.1 Spill/Leak No. 8 (Site 2)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.3.2 Spill/Leak Nos. 1, 2, 3, & 4 - Lower Camp (Site 3)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.3.3 Waste Accumulation Area No. 1 - Lower Camp (Site 11)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of contamination by oil and ethylene glycol;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.4 Results

The following results are presented for each site evaluated in tier II screening in table format as described in section 2.6.2 of this report. The preferred alternative for each site is no action.

2.6.4.1 Spill/Leak No. 8 (Site 2)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.2 Spill/Leak Nos. 1,2,3 & 4 - Lower Camp (Site 3)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.3 Waste Accumulation Area No.1 - Lower Camp (Site 11)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.7 SUMMARY

All of the sites considered in the risk screening were evaluated at the tier II level. The no action alternative is the preferred alternative because it presents the lowest or same risk to human health as other alternatives. The no action alternative also has a lower environmental and economic cost than any other alternative at each of the sites.

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